INDEX NUMBER

DECEMBER, 1961

American Journal of ORTHODONTICS

Volume 47, *Number* 12

THE C. V. MOSBY COMPANY
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USA

Official publication of
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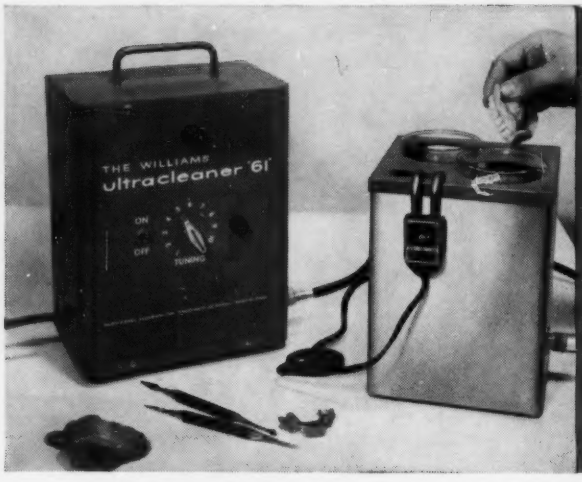

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American Journal of ORTHODONTICS

Volume 47, *Number* 12, DECEMBER, 1961

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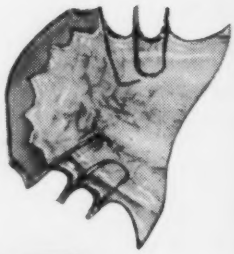

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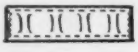

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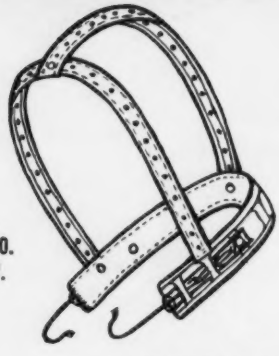

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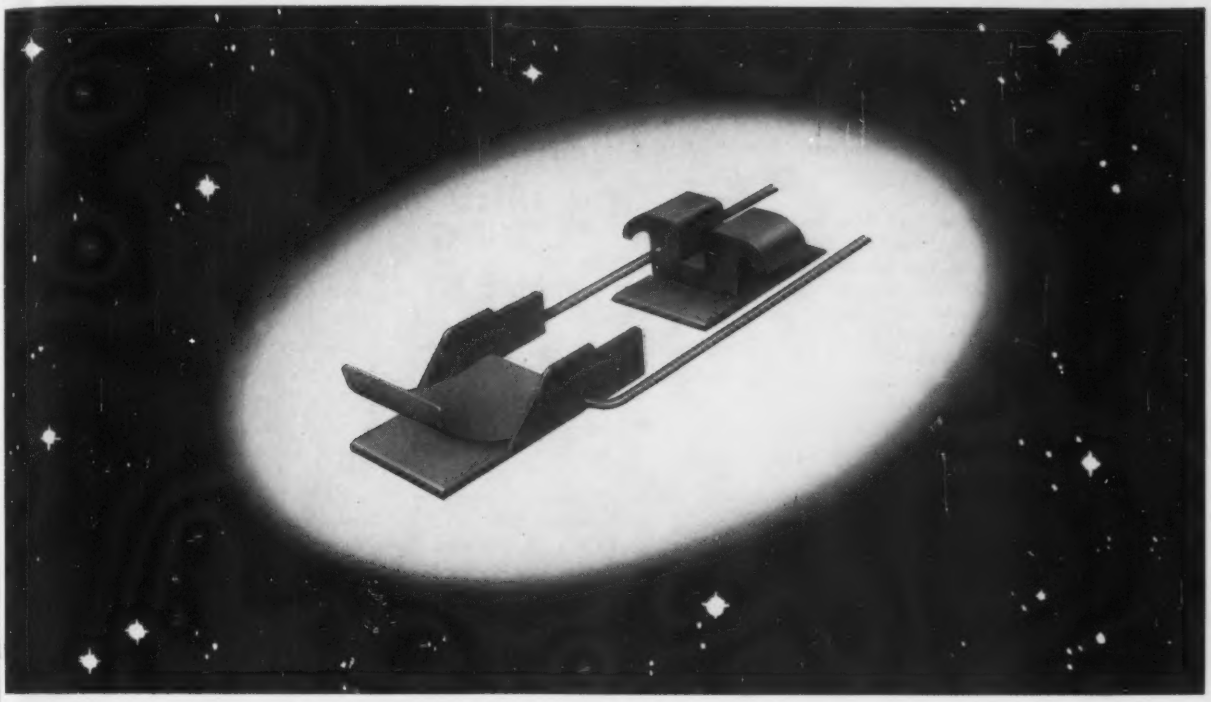

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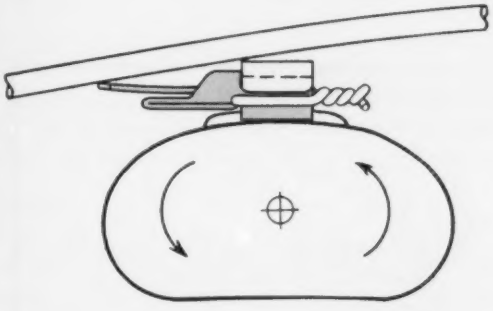

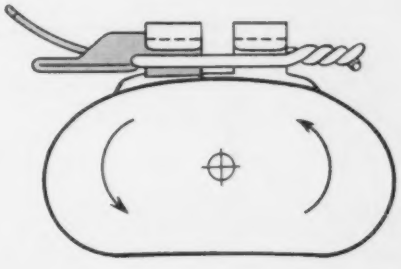

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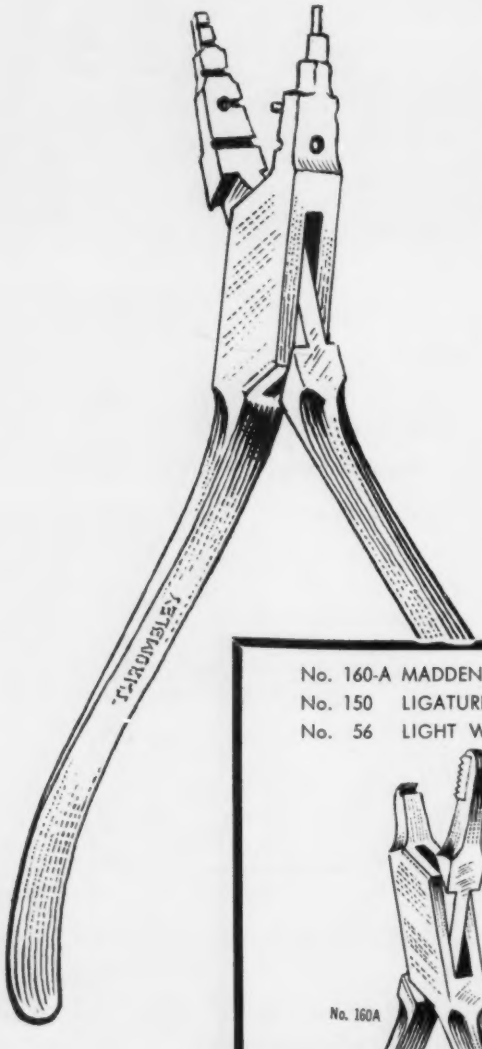

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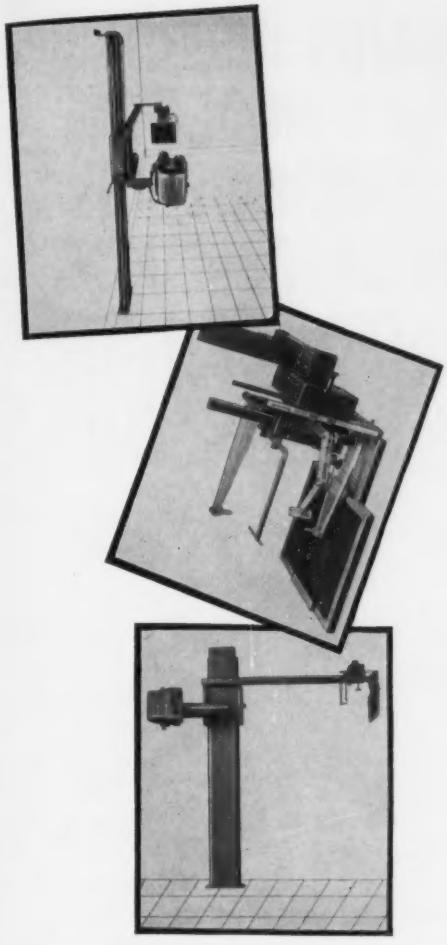

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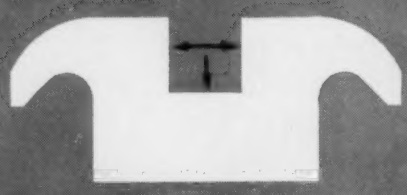

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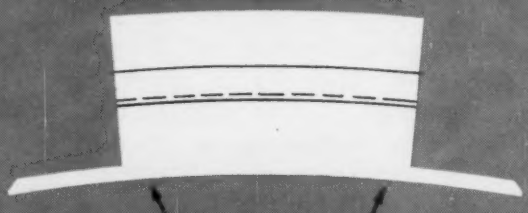

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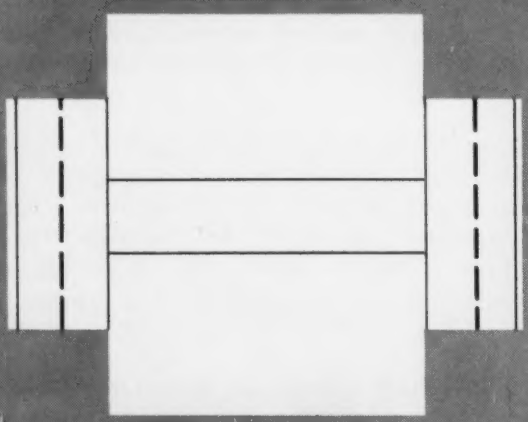

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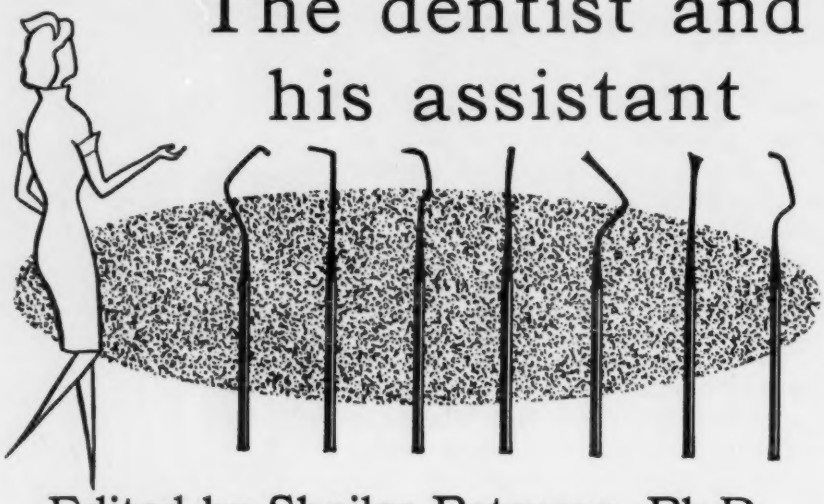

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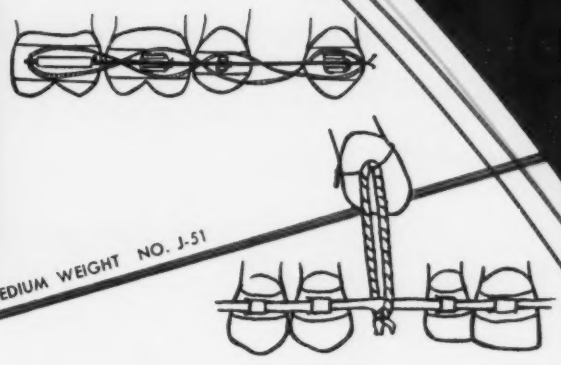

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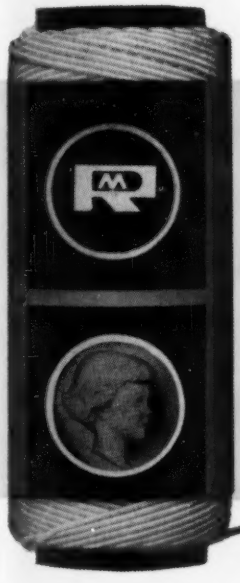

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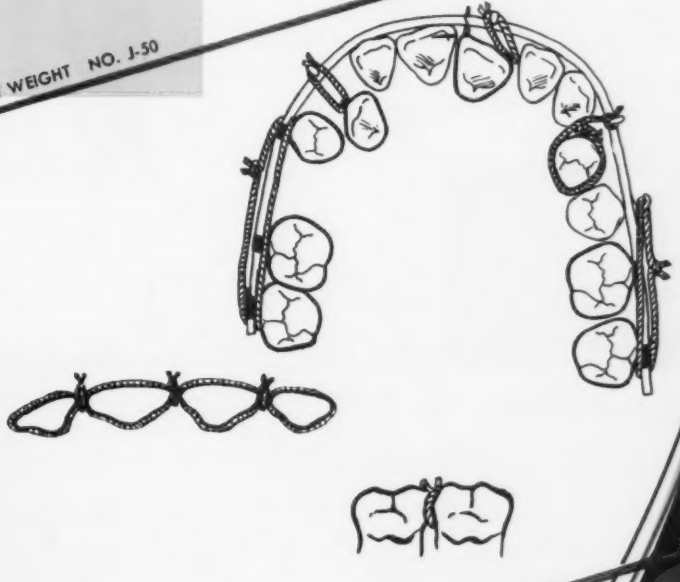

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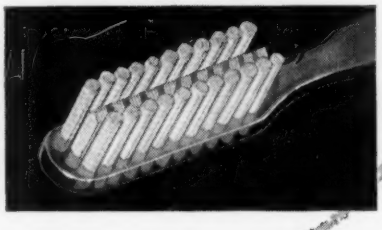

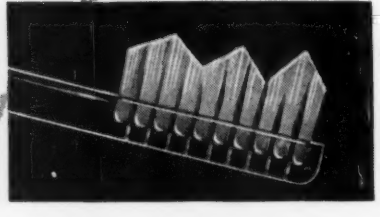

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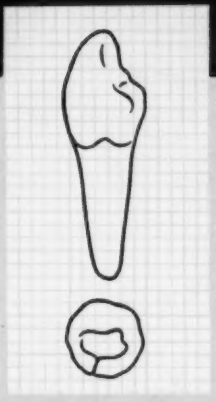

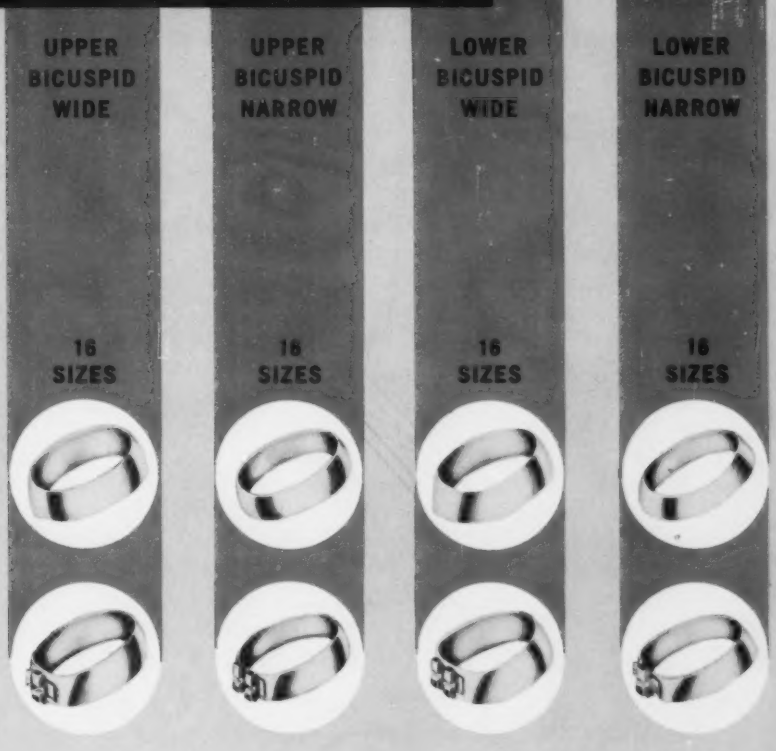

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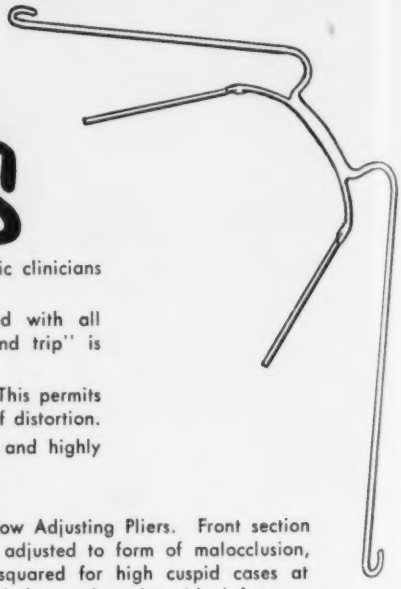

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146LA	.044 inner arch—one outer arm much longer Longer arm is power side. The most perfect functional unilateral face bow, combining orthopoedic power with distal traction.
148SE	.044 inner arch with ends of both outer .065 arms straight and one inch longer.
148SE Plus	.044 inner arch ½ inch longer with both outer .065 arms straight and one inch longer.

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251SE & CS	.044 inner arch same as above but with center spur.

.050 inner arch—.061 outer arms

250AH	.050 inner arch.
251CS & AH	.050 inner arch with center spur.
252LA Left 253LA Right	.050 inner arch—one outer arm much longer. Longer arm is power side.
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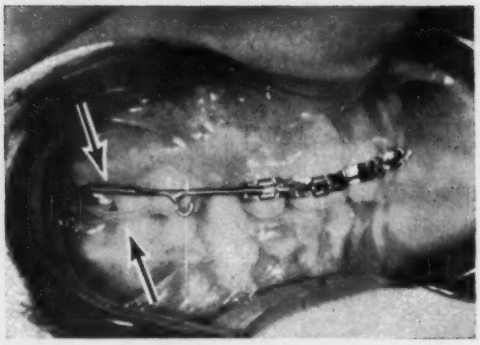

Fig. 141. Combination of compressed coil-spring and intermaxillary elastic traction used in posterior molar movement.

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By EARL E. SHEPARD, D.D.S., F.A.C.D., F.I.C.D., Professor of Clinical Orthodontics and Chairman of the Department of Orthodontics, Washington University, St. Louis, Missouri. Published September, 1961. 157 pages, 6¾"x9¾". Illustrated. Price, $10.50.

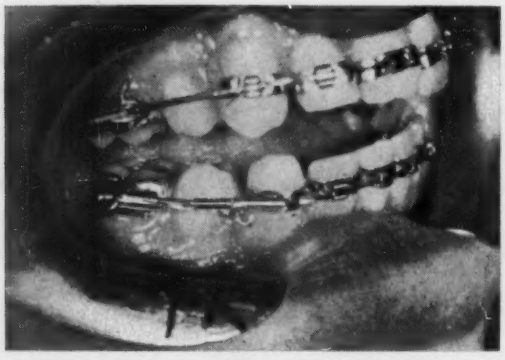

Fig. 131. A, Space closer used on end section of mandibular twin-wire labial arch.

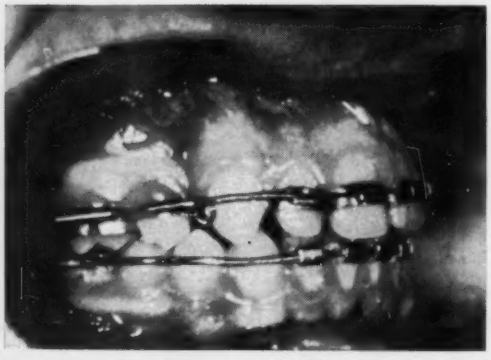

Fig. 131. B, Space closer used on end section of maxillary twin-wire labial arch.

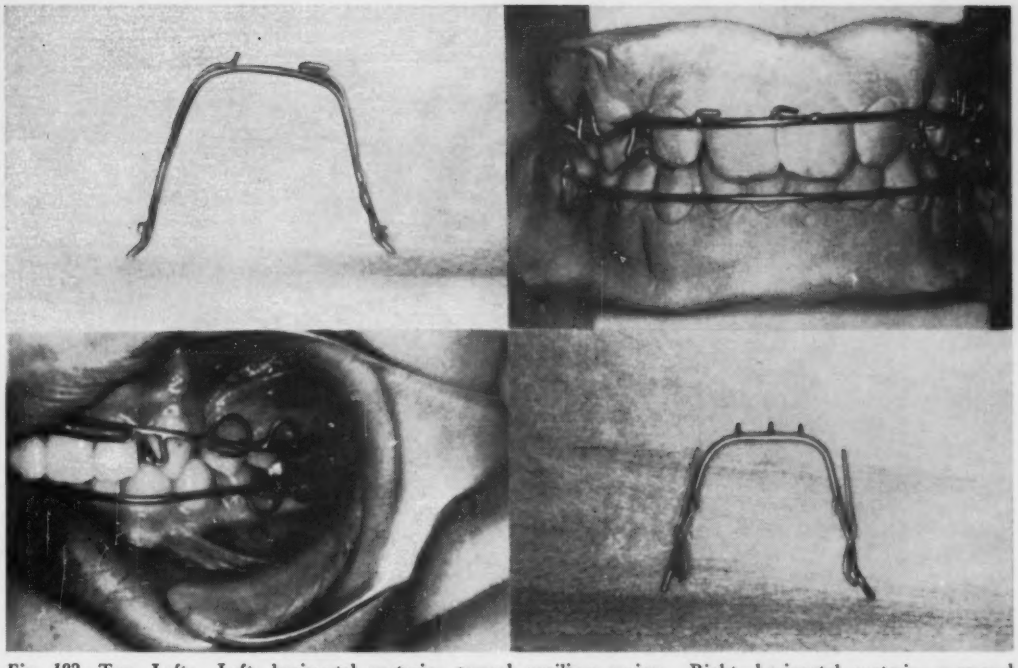

Fig. 182—Top, Left: Left, horizontal posterior curved auxiliary spring. Right, horizontal posterior recurved auxiliary spring. *Fig. 183*—Top, Right: Labial appliance with perpendicular curved auxiliary springs and intermaxillary rubber band hooks of .035 wire. *Fig. 184*—Bottom, Left: Left to right, labial arch with horizontal right angle auxiliary spring, intermaxillary hook, perpendicular loop auxiliary spring, mandibular rubber band hook and labial arch tied in at buccal tube. *Fig. 185*—Bottom, Right: Left and right, horizontal posterior recurved auxiliary spring. Center, perpendicular straight auxiliary spring.

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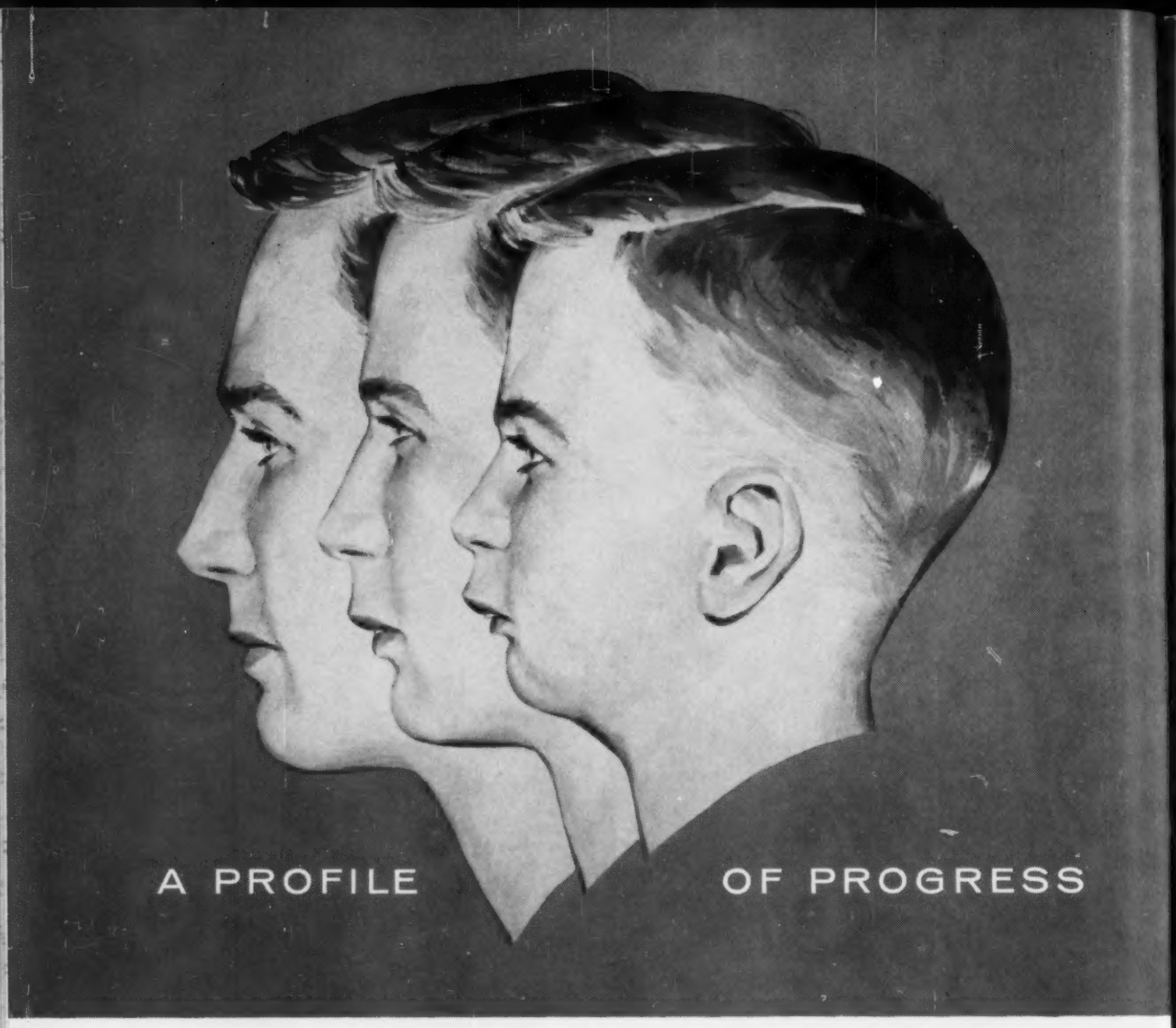

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ORIGINAL ARTICLES

Principles of cephalofacial development revealed by experimental biology

LOUIS J. BAUME, D.M.D., M.S., F.A.C.D., F.I.C.D., F.A.A.S.

Geneva, Switzerland

A great man who neither sought nor shunned greatness, found glory only because glory lay in the plain path of duty.

THESE words of Thomas Babington Macaulay accurately reflect the profile of one of America's great orthodontists, John Valentine Mershon, in whose honor this memorial lecture has been established. Reviewing Dr. Mershon's long and full life from 1867 to 1953, we see that all his interests and desires were steadfastly directed toward one aim—to serve his patients, his colleagues, and his chosen profession to the best of his ability. Leuman Waugh[42] paid tribute to the services that he rendered to humanity above and beyond the call of professional duty when he said: "As long as there is a specialty of orthodontics, Dr. Mershon will be known for his quiet, genial, and generous efforts to help others."

Dr. Mershon earned lasting recognition as a clinician of repute in his private practice, as head of the orthodontic department at the University of Pennsylvania (1916 to 1925), as a leader of professional organizations, and as the founder of postgraduate education in the United States and probably in the world. Above all, however, Dr. Mershon's name remains connected with the lingual arch technique which he introduced in 1916. Ten years later, Dr. Mershon was one of the organizers of the first International Orthodontic Congress in New York. Among the speakers invited to this meeting from abroad was the late Dr. Rudolph Schwarz from Basel, Europe's father of gnathometrics[38] and my revered teacher. From then on Dr. Schwarz kept in personal

From the Institute of Dental Medicine, University of Geneva, Geneva, Switzerland.

The second John V. Mershon Memorial Lecture, presented at the fifty-seventh annual meeting of the American Association of Orthodontists in Denver, Colorado, April 17, 1961.

contact with Dr. Mershon and introduced his philosophy of treatment to Europe. This is how, through generations, a miraculous bond holds together students of a common science for a common cause—the welfare of our fellow man.

As I stated in the Rowlett Memorial Lecture[9] in New York in 1959, one of the fundamental secrets of the unmatched success of American dentistry may be found in the fact that it has always freely accepted new ideas but has always subjected them to careful checking and evaluation. Dr. Mershon must be credited with having implemented this truly American attitude in the field of orthodontics. It is my proud duty here to pay open tribute to your proverbial magnanimity in accepting again—in the best of Dr. Mershon's tradition—a representative from abroad to deliver this second Mershon Memorial Lecture. I express my appreciation to your brilliant president, Dr. W. R. Humphrey; to Dr. J. A. Salzmann, the living link between orthodontics and biology; to Dr. W. Wylie, orthodontics' fine-spirited Voltaire; to Dean H. Noyes, orthodontics' solid pillar of the third generation; and to Dr. O. Oliver, world dentistry's supreme grand master.

Dr. Mershon was one of the first to realize the importance of applying biologic principles of individual growth to diagnosis and treatment of malocclusion. It therefore seems fitting to devote this second Memorial Lecture to a discussion of the "Principles of Cephalofacial Development Revealed by Experimental Biology."

What is the scope of experimental biology? A contemporary French biologist, Jean Rostand,[34] describes the scope of experimental biology as follows:

> With the help of experimental methods the biologist nowadays can interfere with any phase of the life cycle; he controls growth and maturation; he creates at will dwarfs or giants, reverses sexes, produces new races and species; he even manages heredity.

No one knows better than the orthodontist that this statement can refer only to laboratory animals and not to clinical cases.

What, then, is the value of experimental biology? Wilhelm Roux,[35] the father of experimental embryology, has put it succinctly: "By observation we perceive a natural phenomenon; by experiment we force it to reveal its principles."

Experiment, an intentional release of a cause-and-effect sequence under controlled conditions, is at the base of the device in logic called "induction." It permits us to draw a safe conclusion from particular cases to a general truth. It is the tool of the laborious investigator, while the reversed pattern ("deduction") remains the prerogative of the genius endowed with creative intelligence.

Francis Bacon of Verulam, 1610, is credited with having introduced this experimental device of "induction," thereby inaugurating the modern era. And it truly can be said that his method became the key which opened the Pandora's box of all the different natural sciences. From Galilei's discovery of the laws of free fall in 1690 to Gino Segrès' world of antimatter in 1960, the conquest of nature's principles by the human mind was achieved with the help of this most cumbersome of all investigatory methods—the controlled experimental approach.

THE ROLE OF EXPERIMENTAL BIOLOGY IN ORTHODONTICS

In the past, experimental methods in orthodontics created a greal deal of controversy. The reasons, which are shared with dentistry in general, lie in the fact that the fundamentals of oral biology have evolved only recently. Due mention must be made of the efforts in this field by Asling, Becks, and Evans[1, 2, 17] in California, and Krogman[29] in Pennsylvania. It would be fascinating, but too time-consuming for the present occasion, to make a historical roll call of the contributors to experimental orthodontics from the early times of Belchier and Hunter to the more recent period of Brash, Breitner, and Häupl.

Probably the best validation of experimental biology in the field of orthodontic research emerged recently from the Second Workshop on Roentgenographic Cephalometrics, which stated that meaningful experiments must supplement the information gained from cephalometrics in order to arrive at a proper interpretation of growth changes. To paraphrase Salzmann,[37] the cogent chairman of this workshop: "Cephalometrics yields quantitative data while experimental biology is a means of obtaining qualitative information."

Experimental methods are needed in orthodontic research in order to obtain information on (1) the general mechanism of skeletal development and (2) the cephalofacial growth centers.

GENERAL MECHANISM OF SKELETAL DEVELOPMENT

First of all, some basic definitions are in order. *Growth* generally implies a measurable increase of a tissue, organ, or system of organs or organism. Hence, metrical methods are suitable to linear growth assessment. *Development* is used to describe the evolutionary changes in size and structure (organogenesis), position, and relation (topogenesis) that the whole organism or its parts undergo during their life cycle. Analysis of development requires methods suitable to the differentiation of tissues (histology, experimental biology).

The *skeletal system* (the bones) is composed of bone tissue and cartilage with their investing and invested connective tissue structures, namely, periosteum, sutures, endosteum, marrow, and, to a certain extent, the muscular perimysium for bone, and perichondrium and synchondroses for cartilage, respectively, including the joint structures.[19]

Any understanding of skeletal development, therefore, must be based upon the study of the physiology of each of these components and the effects of the interaction of invested or neighboring organs, such as muscles, teeth, brain, etc., upon them.

Osteogenesis, or the formation of bone as a tissue, is everywhere identical in principle, loose connective tissue being always the mother tissue. The same holds true for chondrogenesis, the formation of cartilage tissue, and its eventual transformation into bone.

In the formation of a bone as a skeletal unit, two phenomena must be distinguished: (1) the morphogenesis of a bone (or the development of its outer form and size) and (2) the development of its inner structure (Table I). The expression *growth and transformation of a bone* reflects this double develop-

Fig. 1. *(For legend, see opposite page.)*

mental phenomenon. While structural transformation is continuous, mainly controlled by functional and specific metabolic factors, morphogenesis is chronologically limited by the phenomenon of bone maturation.

Table I. *Skeletal development*

1. Development of form *Morphogenesis* (limited-maturation)		*Endochondral Ossification* in epiphyseal and condylar cartilages, synchondroses (autonomous)
		Intramembranous Ossification in periosteum and sutures (induced)
2. Development of structure *Transformation* (continuous)		Exosteal apposition and resorption *Compact bone*
		Endosteal apposition and resorption *Spongy bone*

Two alternative types of skeletal morphogenesis occur: Bones develop as either membrane bones or cartilage bones or, in the case of the mandible and clavicle, as a combination of both. Membrane bones develop by intramembranous ossification of a fibrous connective tissue in the fetal integument of the viscerocranium and neurocranium. Cartilage bones develop on the basis of a primordial cartilage mold by both endochondral ossification at primary diaphyseal and secondary epiphyseal centers and by intramembranous ossification at the periosteal portions.

Recognition of these two developmental patterns is of paramount importance in orthodontics; their ontogenic, phylogenic, and hereditary aspects, as well as their control by other intrinsic and extrinsic factors, must be studied and thoroughly understood.

DEVELOPMENT OF MEMBRANE BONES. *Ontogenetically,* the first bone formed is membrane bone. At about the beginning of the seventh week of uterine life bilateral anlagen of the mandibular and maxillary bones are found (Fig. 1). They are soon followed by the palatine, zygomatic, and squamotemporal bone plates.

At a later stage, concerted processes of periosteal or sutural apposition on one surface and modeling resorption at the opposite surface are conducive to the hereditary form of each membrane unit.[8, 11]

Fig. 1. *A,* Coronal sections of human fetus, 23 mm. (seventh to eighth week), showing first appearance of mandibular membrane bone (*M*). *MC,* Meckel's cartilage.

B, Coronal sections of human fetus, 35 mm. (eighth to ninth week), showing appearance of maxillary (*Mx*), premaxillary (*Pm*), and zygomatic (*Z*) bones.

This simple type of bone formation is probably also the more primitive one. *Phylogenetically,* these membrane bones, sometimes called integumental bones, are regarded as homologues of the dermal ossicles (scaly plates) of ancestral fish, which are the most ancient bones found in vertebrate phylogeny.[25]

An important fact, recently revealed by experimental embryology, consists of the genetic determination of early embryonic mesoderm areas for membrane bone development. When Fell[20] explanted certain mandibular sectors of the 2-day chick embryo, bone or cartilage was formed, depending upon the site from which the mesodermal tissue was excised.

The primitive form of membrane bones is genetically determined. Hence, the form and structure of membrane bones cannot be considered solely the result of extrinsic factors acting on it, as is implied by Wolff's law.

Häupl[27] and Weinmann and Sicher,[43] among others, have shown that change of function in young growing bones leads to changes in form and structure, while in old matured bones it illicits predominantly structural transformation.

This observation finds its counterpart in the hormonal control of membrane bones, so aptly demonstrated by the experiments of Asling and Evans.[1] While rats hypophysectomized at weaning failed to repair dissected portions of the cranial vault, full restoration followed the administration of growth hormone. This shows the pituitary control of intramembranous osteogenesis during early development. Observations of continued endosteal ossification (osteosclerosis)

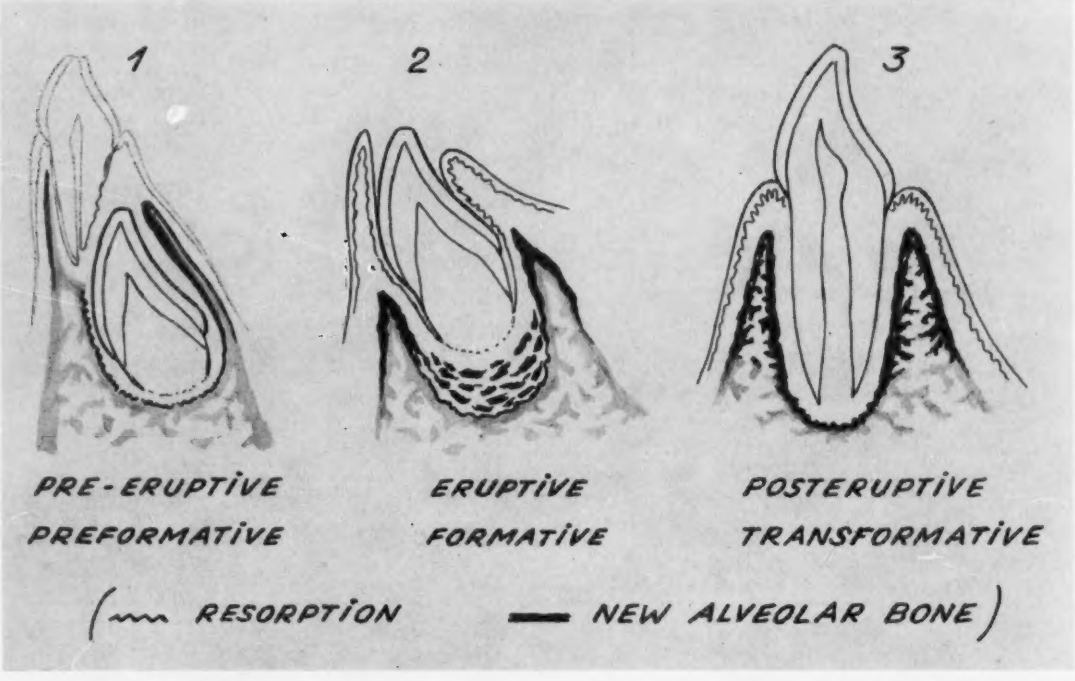

Fig. 2. Schematic drawings illustrating the three developmental stages of alveolar bone as induced by odontogenesis.

in the membrane bones of old hypophysectomized animals indicate, however, that this pituitary control may not remain absolute.[6, 17, 21]

The specificity of membrane bone-forming tissues diminishes with progressive maturation, and these tissues become highly adaptive to environmental influences.[23]

The fields of experimental biology and human pathology present abundant evidence to show that membrane bones are plastic and lack autonomy during the postnatal periods, as demonstrated by jaw deformations due to certain habits or to rachitism.

Mention must be made of the particular biologic characteristics of alveolar bone. Our histologic surveys[3, 4] have clearly shown that each dental organ induces the development of the pertinent sector of the alveolar process. Tooth and investing bone form a developmental entity with a life history of three phases: (1) the pre-eruptive preformative, (2) the eruptive formative, and (3) the posteruptive transformative stages (Fig. 2).

As the developing tooth is the original inductor of alveolar bone, the orthodontist may guide its development either by influencing the bone directly with so-called "activators" or indirectly by means of a fixed appliance over the tooth. The latter approach rarely affects the preformative stage of unerupted teeth, whereas the former seldom gives the precise results of the latter.

DEVELOPMENT OF CARTILAGE BONES. The entire axial and appendicular skeleton (with the exception of the clavicle), as well as the cranial base, develop from cartilaginous precursors by both endochrondral ossification and periosteal ossification.

Table II. *Biologic differences between cartilage and bone tissues*

	Cartilage	*Bone*
1. Growth	Interstitial and peripheral	Only peripheral
2. Hormonal control	Strict	Less dependent
3. Genetic determination	Rigid	Diminishing with age
4. Mechanical stimuli	Unresponsive	Highly responsive

Many of the intricate processes involved in the development of cartilage primordials, particularly of the branchial viscerocranium, can be understood only from their *phylogenetic* aspect. For instance, in chordates Meckel's cartilage was originally a gill-supporting structure; later, in fishes, amphibia, and reptiles, it was a part of the jaw skeleton; finally, in mammals, it became a part of the ear ossicles (malleus) and sphenomandibular ligament.[25]

Cartilage tissue is subject to biologic laws differing from those of bone tissue, from which stem the significant differences between membrane bones and

Fig. 3. Mechanism of endochondral ossification in a long bone.

A, Establishment of the primary center of ossification within primordial cartilage mold is accompanied by formation of a perichondral bony splint (*Sp*).

B, After establishment of the secondary ossification center (*SO*), the epiphyseal cartilage plate assumes a zonal arrangement: embryonic zone of interstitial proliferation (*a*), zone of young chondroblasts (*b*), zone of cartilage degeneration and erosion (*c*), and zone of ossification (*d*).

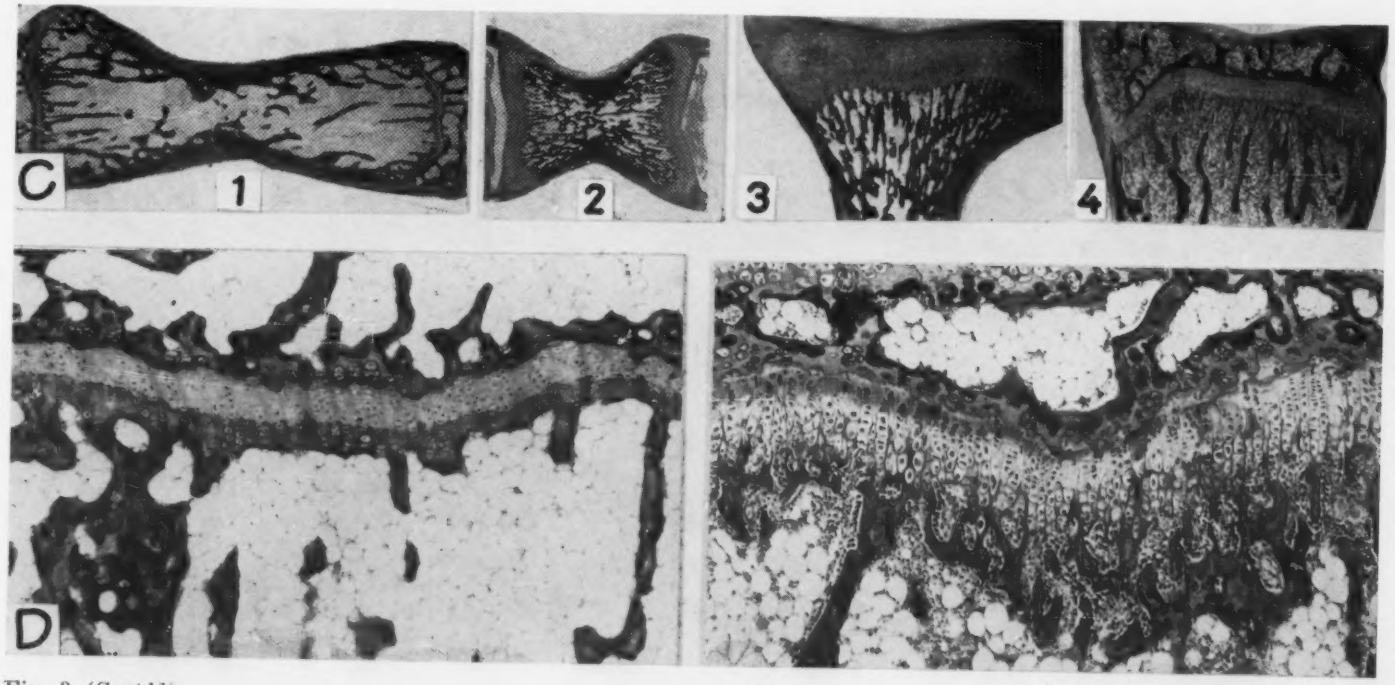

Fig. 3 (Cont'd).

C, The thyroid hormone presides over cartilage erosion (bone maturation). *1,* Normal long bone; *2,* same bone in rat thyroidectomized at birth; *3,* higher magnification of thyroxin-deprived epiphysis, revealing absence of secondary ossification centers; *4,* maturation is induced by thyroxin administration after thyroidectomy.

D, The pituitary growth hormone presides over chondrogenesis and osteogenesis. *Left:* Sealed-off, inactive epiphyseal plate of long bone after hypophysectomy. *Right:* Upon administration of pituitary growth hormone, endochondral ossification is resumed, even after a long postoperative interval. (From Baume, Becks, and Evans.[14])

cartilage bones (Table II). Brought to light by recent experiments, these observations reveal the following four facts:

1. Cartilage grows interstitially, as well as peripherally. Bone accrues only at surfaces.
2. Cartilage proliferation is governed by the pituitary growth hormone; cartilage erosion by the thyroid hormone.[2, 6] Osteogenesis, as well as osteoclasia, however, may proceed in the absence of these hormones.[14] (See Fig. 3.)
3. Morphogenesis of the cartilage skeleton shows a more rigid genetic determination than do membrane bones. Tissue cultures of avian blastema may form rudiments of articulations, even in the absence of muscles.[23]
4. Cartilage, in contrast to membrane bones, is highly unresponsive to mechanical stimuli. Cartilage bones, including the mandibular ramus, grow independently of the direction of the forces exerted by the invested muscles[8, 41] (Fig. 4). In cultivated rudiments of long bones,

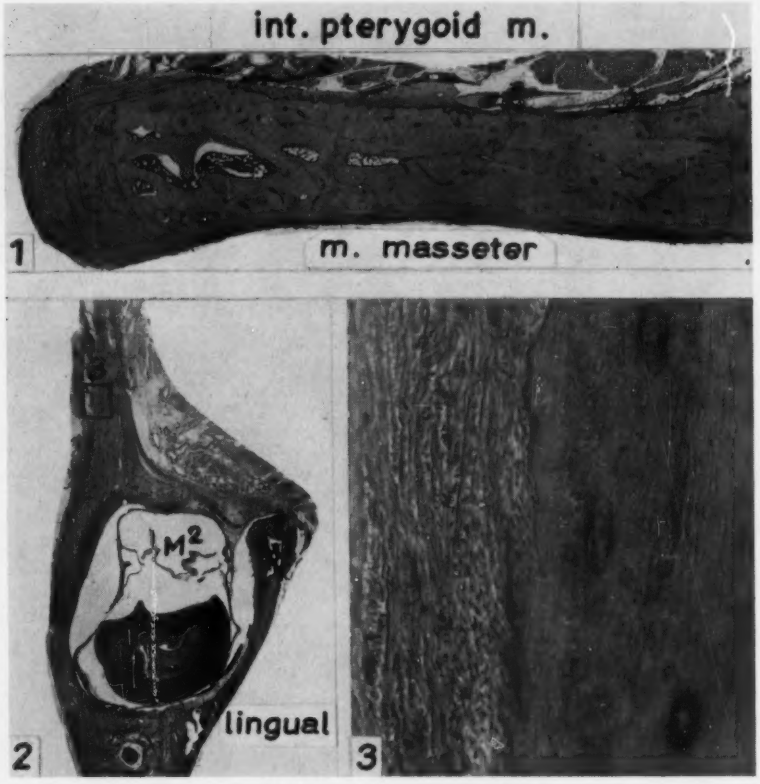

Fig. 4. The mandibular ramus grows independently of the direction of the inserted muscle: *1*, Horizontal section of ramus shows accretion at caudal end in a direction opposite the forces of the masseter muscle. At the site of insertion of the internal pterygoid muscle, modeling resorption takes place. *2* and *3*, At the site of insertion of the temporal muscle, bone resorption occurs in order to clear the way for the erupting second permanent molar. (From Baume, L. J.: *Rev. belge sc. dent.* **14**: 567, 1959.)

Table III. *Definitions*

Skeletal growth center:	Place of endochondral ossification with tissue separating force
Skeletal growth site:	Region of periosteal or sutural bone formation and modeling resorption adaptive to environmental influences

compressive stresses did not stunt growth whereas tensile stresses somewhat accelerated endochondral ossification.[24] After the epiphyseal plates in growing calves had been compressed by the application of pressures of 400 pounds per square inch, absolutely no slowing of longitudinal growth was observed.[39] These experimental results are in keeping with the clinical experience that growing epiphyseal plates in children can break steel staples that have been inserted for the purpose of retarding growth.[18]

Endochondral ossification thus constitutes the mechanism by which the skeleton develops into genetically predetermined size and form, notwithstanding mechanical interference from the environment. We therefore suggest that the places of endochondral activity should be called "growth centers" in contrast to the "growth sites" where membranous bone formation proceeds in sutures and periosteal sectors (Table III).

CEPHALOFACIAL GROWTH CENTERS

The intricate developmental phenomena which the orthodontist has to survey in his young patient necessarily represent the end phases of processes that start prenatally during fetal life. The basicranial growth centers are, in fact, the last rudiments of the cartilage primordia of the fetal skeleton.

A midsagittal section through the head of a 20-week-old fetus reveals a coherent cartilaginous skeleton comprising the entire skull base, including the nasal septum (Fig. 5). Two centers of ossification are forming at the basisphenoidal and occipital portions. At a later stage the presphenoidal center originates, also giving rise to a so-called synchondrosis. We have studied, both experimentally and histologically, the activity of these *basicranial synchondroses* and have reached the following conclusions:

1. The basicranial synchondroses are growth centers homologous to epiphyseal plates of long bones.
2. Contrasting the latter's centripetal activity, cranial synchondroses have a bipolar growth potential. Differential ossification activity at both cartilage margins is conducive to progressive changes of the basicranial angulation.[46]
3. Synchondrosal activity, as shown by Asling,[2] is subject to the same endocrine control as epiphyseal cartilage: growth hormone presides over chondrogenesis and thyroid hormone presides over cartilage

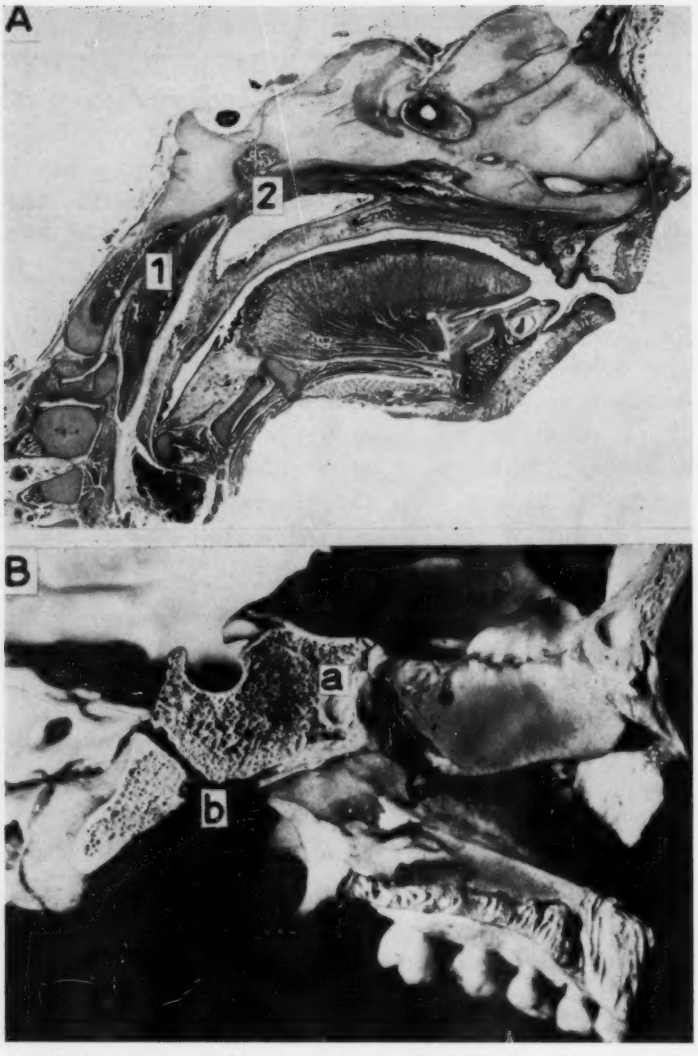

Fig. 5. *A,* Midsagittal section of human fetus head, 147 mm. (seventeenth to eighteenth week), showing coherent primordial cartilage, including skull base and nasal septum. Two centers of endochondral ossification are forming at the occipital portion (*1*) and at the basisphenoidal portion (*2*).

B, Dissected skull of 7-year-old infant shows fused presphenoideo-basisphenoidal synchondrosis (*a*) and patent sphenoccipital synchrondrosis (*b*). The perpendicular bony plate of the ethmoid is little developed.

erosion. In endocrine experiments in rats we were able to produce distoclusion and brachycephaly.[5, 6]

4. The position of sella and any other superstructure of the cranial base is determined by the growth pattern of the invested organ, namely, the brain stem with its adhering pituitary gland.[7] Caught by the growth momentum of the supporting cranial base and the investing pituitary gland, sella can by no means be considered a stable point of reference in growth studies (Fig. 6).

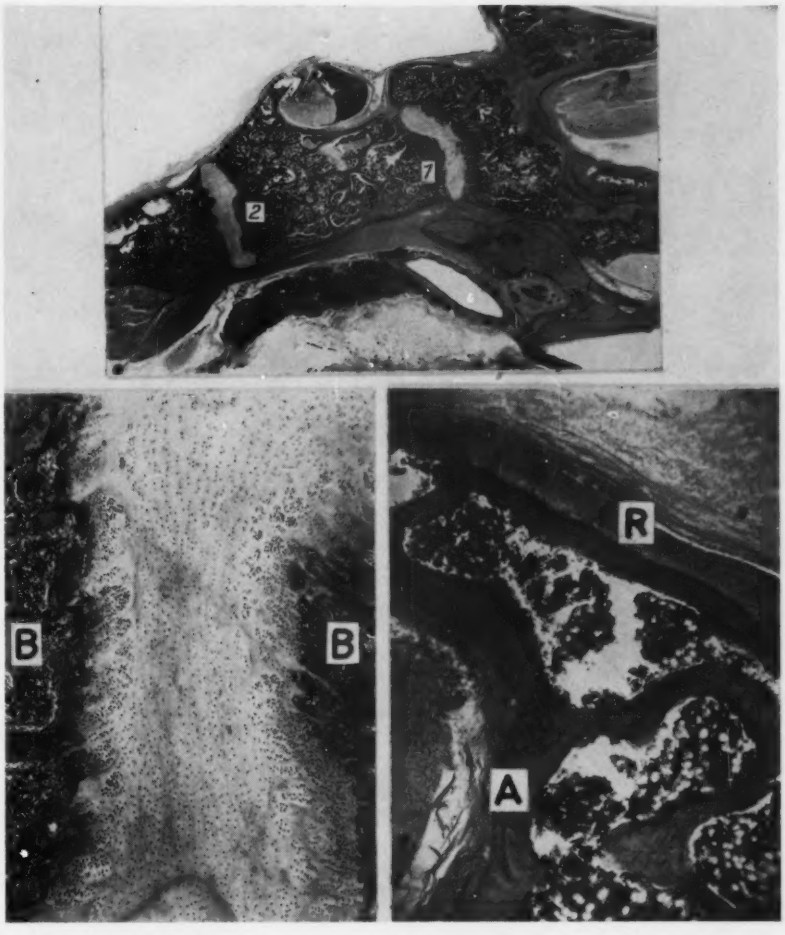

Fig. 6. The basicranial synchondroses (*1* and *2*) provide as growth centers at both ends bulk of new bone (*B*), which undergoes transformation under the modeling influence of neighboring organs, such as the expanding pituitary gland and the brain. Note modeling resorption (*R*) at clivus and bone accretion at posterior border of sella. The sella point cannot be considered stable. (From Baume, L. J.: *Tr. European Orthodont. Soc.* 33: 150, 1957.)

It is said that in the infant skull all synchrondroses between the ethmoid bone and two portions of the sphenoid bone (presphenoid and basisphenoid) have fused except for the spheno-occipital synchondrosis, which fuses at the age of about 18 to 20 years. Few details are known in view of the difficulties of obtaining immediately fixed autopsy material of infant heads.

Recent histologic observations on monkey material[10] suggest, however, that so far we may have overlooked an important growth center that presides over the entire development of the upper face, namely, the synchondrosis formed by the nasal cartilage septum with the perpendicular plate of the ethmoid bone. This *nasal cartilage* septum—a persisting derivative of the primitive cartilage primordium—at its vomerine junction keeps an interstitial growth activity that, together with the endochondral ossification at the ethmoideoseptal junction brings about the downward and forward development of the maxilla and the entire middle face complex (Fig. 7).

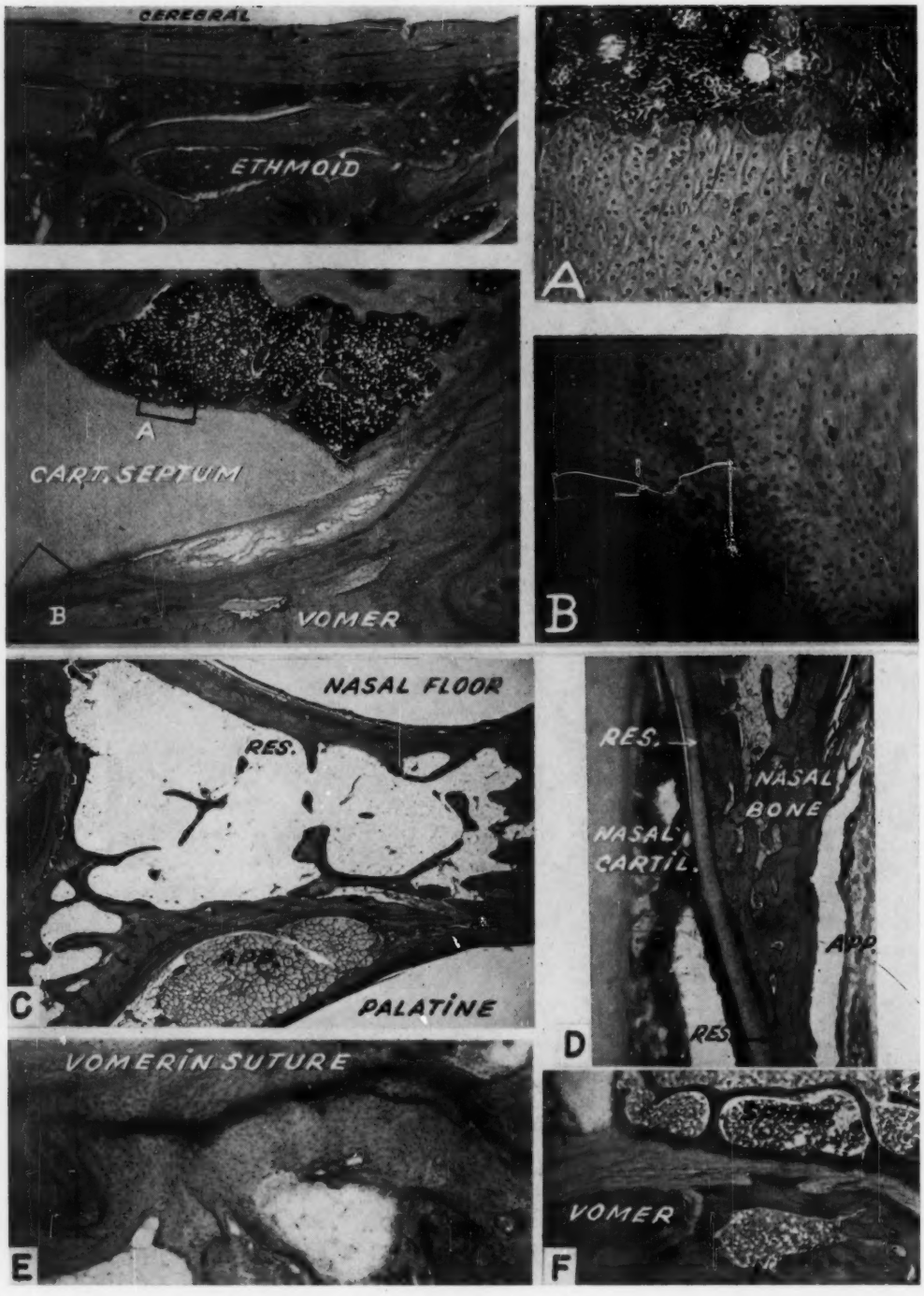

Fig. 7. The nasal cartilage septum ossifies endochondrally at the ethmoidal synchondrosis (*A*) and proliferates at the vomerine syndesmosis (*B*). Its expansive growth activity brings about a downward movement of the nasal floor through bone apposition at the palatinal surface (*C*) and a forward movement of the nasal bone (*D*), while the palatovomerine suture is at rest (*E*); *F*, the vomer (*V*) grows at the sphenoidal (*Sph*) suture. (From Baume, L. J.: *Helvet. odontol. acta* 5: 9, 1961.)

Histologic studies of human material, now being made by Derichsweiler,[22] should be helpful in the better understanding of the mechanism of facial development and management of certain cleft palate cases.

TEMPOROMANDIBULAR JOINT. In the past, much work has been devoted to the effects of orthodontic treatment on the temporomandibular joint. Reference is made to the brilliant studies by Moore[30] and Ricketts.[33] If the condylar cartilage were a growth center similar to the epiphyses, mechanical stimuli would have little or no influence on it. The pitfalls of such reasoning by deduction analogies in biology, stressed by Wylie,[44, 45] can best be demonstrated in this instance.

Table IV. *Biologic differences between condylar and epiphyseal cartilages*

	Condylar cartilage	*Epiphyses, synchondroses*
1. Origin	Secondary formation on original membrane bone	Derivative of cartilage primordial
2. Growth	Peripheral in fibrocartilage covering	Interstitial, three-dimensional in hyaline cartilage
3. Maturation	No secondary ossification center, no maturation	Secondary ossification centers, final fusion
4. Hormonal control	Atypical response to thyroxine	Regular pattern
5. Mechanical stimuli	Responsive	Unresponsive

From recent histologic and experimental studies, we can infer the following differences between this condylar growth center and the epiphyseal centers (Table IV):

1. Ontogenetically, condylar cartilage develops in a manner completely different from other endochondral growth centers. Condylar cartilage, as first shown by Symons,[40] originates from mesenchymal tissue, independently from Meckel's primordial cartilage, at some distance from the caudal end of the membranous mandibular bone, at a relatively late period (third fetal month, 42 mm., as shown in Fig. 8). We therefore speak of a so-called secondary cartilage.
2. The endochondral activity is also distinctly different from that of an ordinary epiphyseal center. Chondrogenesis proceeds in a fibrocartilage covering only peripherally, and no secondary ossification center is formed. Also, condylar cartilage never loses its growth potential by maturation.
3. Hormonal control of the condylar growth activity differs quantitatively and qualitatively from epiphyseal cartilage. Thyroxin substitution in either hypophysectomized or thyroidectomized rats failed to elicit quantitative responses, such as those seen in all epiphyses and synchondroses of the same animals.[13]

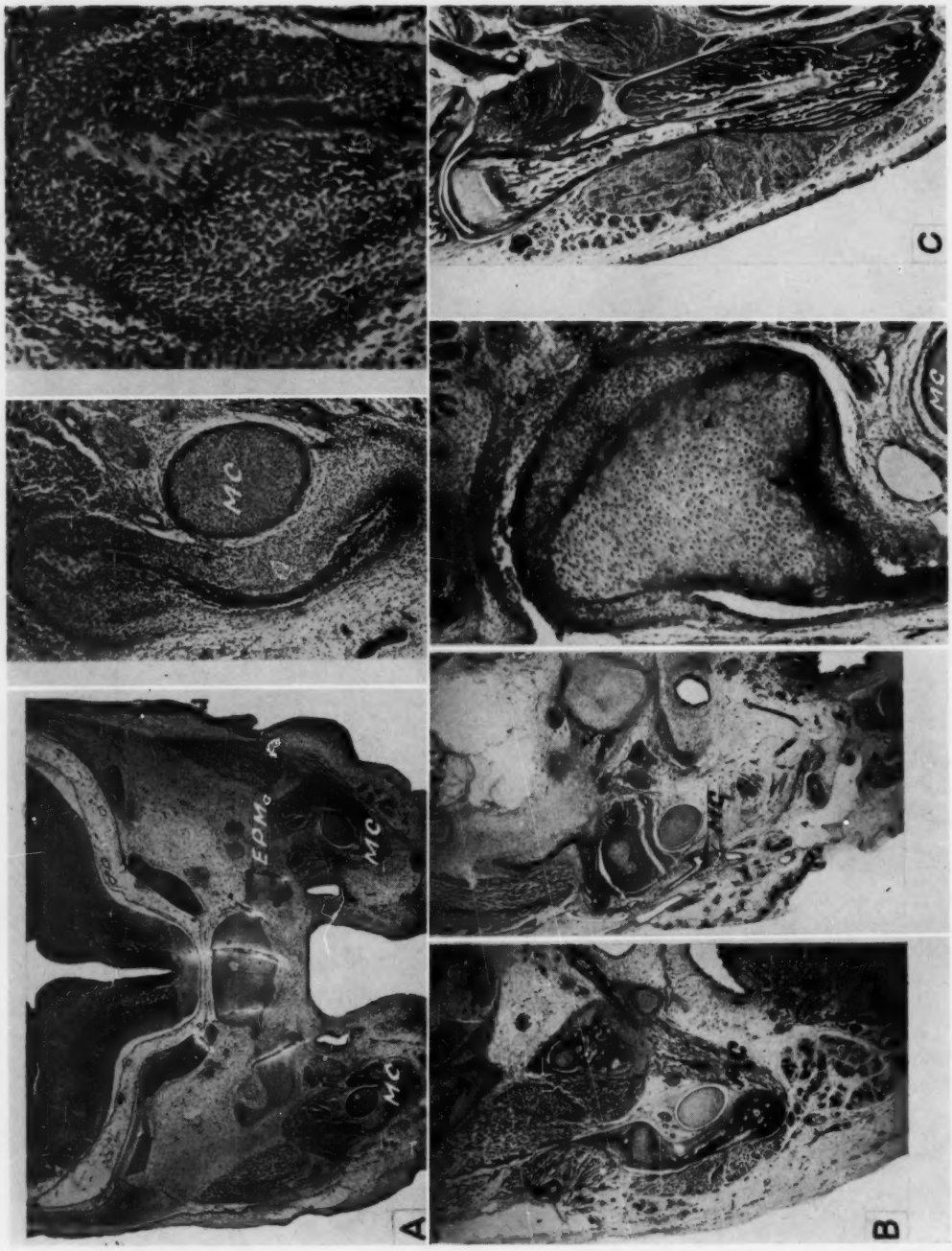

Fig 8. *(For legend, see opposite page.)*

4. Condylar cartilage, in contrast to epiphyseal cartilage, is highly responsive to mechanical stimuli.

Last year Häupl, Stellmach, and Baume[15] published the histologic and roentgenographic results of an orthopedically treated case of Robin's syndrome in a 7-month-old infant. These results included a growth spurt of the condyle and a forward displacement of the fossa. Since it was doubtful whether the observed growth spurt of the condyles was the result of treatment or a sequela of an intrinsic growth tendency, such as shown by Pruzansky,[32] Derichsweiler and Baume[12] designed a controlled experiment in three rhesus monkeys. One animal served as control, whereas the others were fitted with oblique bite planes that induced a permanent forward positioning of the mandible (Fig. 9).

Roentgenographic, vital staining, and histologic analysis of the temporomandibular articulations after two and one-half and four and one-half months of treatment, respectively, yielded the following results:

1. The condylar cartilage, with its endochondral growth apparatus, responded most actively to functional therapy. Upon treatment, the condylar head assumed a prolonged bilobed shape as part of a growth response that tended to compensate for the induced mandibular displacement.
2. Transformations of the joint structures of the temporal bone remained at a microscopic level.

Comparison of similar experimental results reported by Breitner,[20] Häupl and Psansky,[26] Ota,[31] Hoffer and Colico[28] suggest the following tentative conclusions:

1. The younger the subject, the greater and faster is the induced growth response of the condyles and the joint structures of the temporal bone to tensile stresses.
2. Transformation of the glenoid fossa depends upon a stable forward positioning of the mandible during an adequate period of time.
3. Constant forward positioning of the mandible engenders traumatic joint lesions in adolescents.
4. Activator bite planes consistently stimulate condylar growth, never harming but not necessarily transforming the joint structures of the temporal bone.

Fig. 8. Development of the condylar cartilage in human embryos.

A, At the 44 mm. stage rapid intramembranous bone formation proceeds at caudal end of mandible in the vicinity of the external pterygoid muscle (*EPM*) and distant from Meckel's cartilage *(MC)*. (Magnifications: ×12, ×35, and ×55; reduced ⅓.)

B, At the 63 mm. stage between the tenth and eleventh weeks in the core of this caudal end rapid cartilage formation in an upward and outside direction occurs. (Magnifications: ×12 and ×55; reduced ⅓.)

C, At the 147 mm. stage (seventeenth week) condylar cartilage conducts endochondral ossification leading to the formation of the condylar process and the posterior portion of the ramus. (Magnification, ×8; reduced ⅓.)

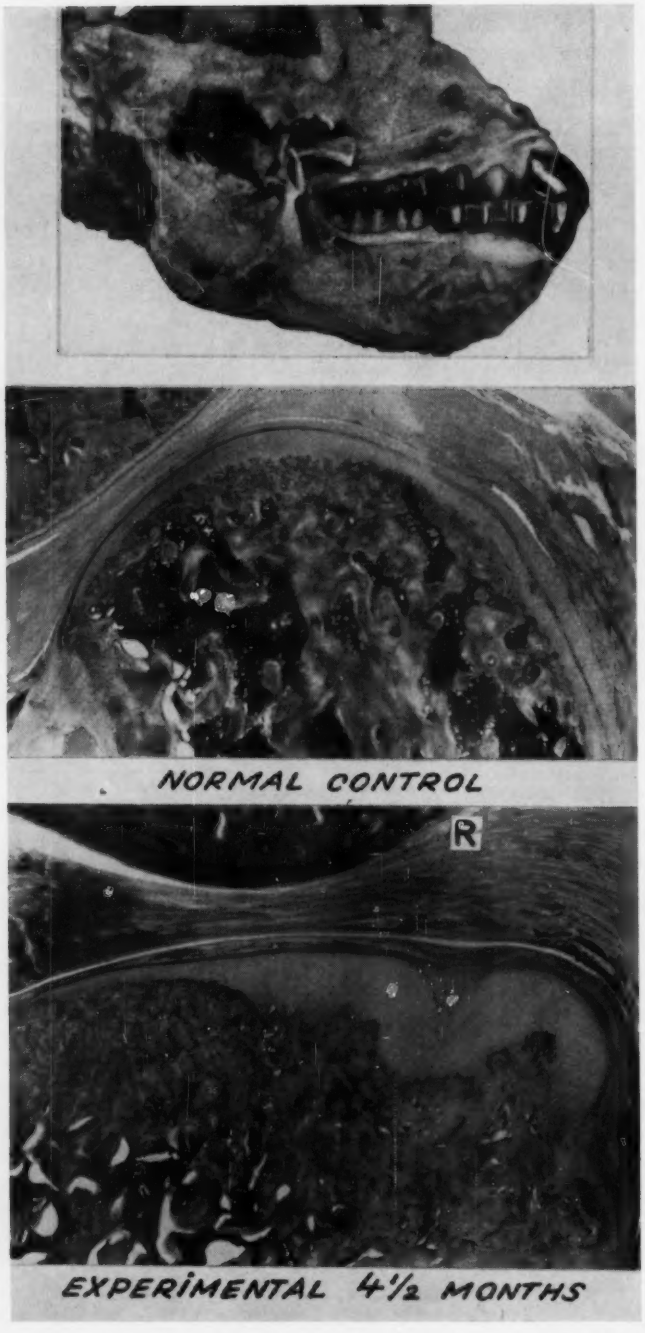

Fig. 9. Tensile stresses exerted by bite planes following four and one-half months of treatment have induced an obvious transformation of the condylar head in a monkey aged approximately 47 months. (From Baume and Derichsweiler: *Oral Surg., Oral Med. & Oral Path.* **14:** 347, 1961.)

5. So far no evidence has been presented to show that compressive stresses would stunt condylar growth.

It is now up to the orthodontic clinician to test these experimental suggestions with conforming appliance therapy in well-analyzed cases. In doing so, he will enter the ever-expanding circle that correlates basic research and clinical progress.

On the verge of its trespass into the universe, modern biology is more than ever convinced of the "great chain of being" connecting, from ameba to man, myriads of generic variations by common laws of life.

Orthodontic research, as a noble member of this life-science study group, must toss a line across the gap that for too long has separated our applied discipline from the basic humanities. To quote one of our early biologic thinkers, Oliver Wendell Holmes: "To be the master of any branch of knowledge, you must master those which lie next to it."

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Removing our limitations

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DISCREPANCY between tooth structure and the length of the dental arch is a problem that seems to be confronting the clinical orthodontist with ever-increasing frequency. Perhaps our mode of living and changes of evolution are the factors most responsible for this.

Some of the most informative and basic articles ever to appear in the orthodontic literature were those written by Nance[1, 2] on the limitations of orthodontic treatment.

Nance's study consisted of an analysis and comparison of measurements taken from models at various stages of development. These records were taken from both treated and untreated patients and from the offices of many participating orthodontists. The information was collected over a period of twenty-six years. Measurements were taken on the same patients before treatment and again after many years had elapsed. For all practical purposes, the basic facts outlined in these articles have never been disproved.

Some of the fundamental points brought out in Nance's articles are as follows:

1. If a stable, permanent result is to be attained in orthodontic treatment, mandibular teeth must be positioned properly in relation to basal bone.

2. Arch length may be permanently increased only to a limited extent. The labial movement of mandibular anterior teeth is indicated only when those teeth have been tipped to an abnormal lingual-axial inclination by a deep overbite or by some other mechanical factor. A limited amount of permanent increase may be obtained through buccal expansion in some cases, but not in all. Distal movement of mandibular molars is called for only in cases of bona fide mesial drift occasioned by the premature loss of second deciduous molars or the loss or congenital absence of second premolars. These limitations upon permanently increasing the arch length oblige the orthodontist to remove tooth structure in the majority of cases with rotations, crowding, or with anterior teeth tipped forward of bony base.

3. Excessive lingual tipping of mandibular incisors is to be deplored as much as excessive labial tipping of these teeth.

Presented before the Pacific Coast Society of Orthodontists in Seattle, Wash., Aug. 6, 1961.

4. The length of the dental arch from the mesial of one mandibular first molar to the corresponding tooth on the opposite side is always shortened in the transition from the mixed to the permanent dentition. Furthermore, this arch length cannot be permanently increased through orthodontic treatment in the mixed dentition; but, on the other hand, it will decrease. [Dr. Nance lists some exceptions to this rule as will be pointed out later.]

5. The distance from the mesio-lingual of the mandibular first molar to the mandibular midline always shortens in the transition from the mixed to the permanent dentition. This distance cannot be permanently increased through orthodontic treatment in the mixed dentition allowing again for the same exceptions.

6. It is a fact that the mixed dentition is characterized by an end-on relationship of the maxillary and mandibular first permanent molars instead of the usual cusp-in-groove relationship.

In studying the average mesiodistal width of teeth in Black's text on dental anatomy, Nance noted that the mandibular deciduous canine, the first deciduous molar, and the second deciduous molar were 1.7 mm. wider than the teeth which would succeed them, that is, the permanent cuspid and two premolars.

In his measurements, he found that this is not always true, and that sometimes there will be as much as 4 mm. on each side and sometimes there will be none. In a cursory examination a good indicator is the width of the lower deciduous second molar. The average leeway in the maxillary arch, according to Black's averages, is only 0.9 mm. This explains the end-on relationship in the mixed dentition. In making a diagnosis, it is very important to note whether or not this end-on relationship of the first permanent molars exists in mixed dentition cases so as to know whether or not to subtract 1.7 mm. from the available arch length.[1]

I believe that a great many mistakes in diagnosis and treatment philosophy have resulted from the failure of a number of orthodontists to read these articles carefully enough. Incomplete understanding causes one to think that he is limited too much in orthodontic treatment. If we were to take the principles laid down as being law, we would find that the great majority of our cases fall into the category of extraction cases. However, if we read the small print which outlines the exceptions to the rules, we find that the Class II, Division 2 cases and the Class I deep-overbite cases which resemble them are noted by Nance to be exceptions to the rule. Cases in which there are excessively lingual tipped incisors are also cited as being exceptions to the rule.[2] These exceptions certainly make up a large group of cases in an orthodontic practice.

ARCH LENGTH CAN BE GAINED BY DISTAL TIPPING OF BUCCAL TEETH

I must admit that in my own practice, if I had read the "small print," I could have saved many patients from the needless extraction of premolars. One only has to draw a silhouette of a lower molar in a tipped-forward position and then show it in an upright position to realize that a good 3 mm. on each side can sometimes be gained in arch length merely by tipping the lower first molar distally to an upright position.[12] I do not think that we would be expecting too much to assume that it would maintain itself in this upright position

if it had not been moved forward of its original position by Class II mechanics or some similar force.

Why, then, can we not upright the lower buccal segments and unravel any crowding or correct any procumbency of the lower anterior teeth with the space made available by using Tweed's Class III mechanics? We would follow this with a distal driving of the upper buccal segments with headgear of the Kloehn type[4] until we have a normal cusp-in-groove relationship of first permanent molars. Why can we not expect these teeth to remain stabile? In some patients, notably the ones with lingually tipped incisors, some Class II mechanics can be used without moving the lower teeth "out of bounds."

By uprighting lower buccal teeth and unraveling a lower arch, it is true that we sometimes crowd the distal portion of the arch, but in many of these growing young patients that area distal to the first and second permanent molars will later accommodate the teeth which are crowded back into it. This distal tipping of lower buccal segments with Tweed's Class III mechanics followed by the distal driving[3] of the upper buccal segments with the Kloehn type of headgear and light Class II mechanics is saving patients in the so-called borderline cases from needless extraction of premolars.

EARLY TREATMENT

I feel that there are lots of unexplored possibilities in early treatment. At a recent meeting one of our leading orthodontic teachers mentioned briefly some research that had come to his attention in which a tooth bud had been planted in the belly wall of a laboratory animal. The experiment "took," and when the tissue was studied under the microscope not only enamel, dentine, and cementum but also alveolar bone were seen.[6] If the erupting tooth produces the alveolar bone which will later hold it, we should then be able to bring about permanent expansion in some of the cases in which we give early treatment.

It is my opinion that in most borderline cases the patients would be better off treated without premolar extraction. What a sad predicament it is to have the teeth out and then to find space apparently appearing from nowhere! A very careful Nance analysis, as well as a careful cephalometric analysis, is a must in our diagnosis of every case.

VALUE OF HEADFILMS

It is very difficult for even an experienced orthodontist to determine accurately the position of the lower incisor without a lateral headfilm of the patient. Other factors which are easily overlooked in a clinical examination of the patient and a study of orthodontic models are such things as the relationship of the bony base of the maxilla to the mandible (or ANB angle), the size of the nose, the amount of chin button or bone anterior to point A, and the thickness of the soft tissue pad overlying pogonion. Also, the Go-Gn-SN angle is usually a good indicator of the amount and type of forward growth to be expected in the case.

The headfilm itself yields more information than the numerical tabulations on the cephalometric tracing. The tracing of headfilms is a duty that should not

be delegated to auxiliary personnel, for it is at this point that the orthodontist can take time to study the headfilm carefully. In a busy practice there is a tendency to concentrate on treatment, and one never quite finds time to study the problem completely before proceeding with treatment. While tracing, such things as position of unerupted teeth, open-bite tendency, shape of mandible, and chronological development can be noted at a glance. At this time mental notes can be made which will influence one's thinking when the study of casts and intraoral roentgenograms is made.

When a final diagnosis and treatment plan have been made, they should be written in detail on the headfilm tracing so that there will be no vacillation once the treatment is under way. This is especially important in an office where treatment is not completely standardized. Many times, after a patient has been under treatment for a year or so, it is possible to forget what the objective was at the beginning.

Extreme caution must be exercised in the extraction of teeth in a patient with an inherent flatness to his face or a low ANB angle—even when it appears that there is a slight deficiency. As the saying goes, "Sometimes the cure is worse than the disease." This premolar area of the masticatory mechanism is of utmost importance in both biomechanical function and esthetic consideration. I have seen many cases in which the extraction procedure has been used and anchorage has been deliberately wasted without satisfying the objectives of orthodontic treatment. These are the cases in which patients have a dished appearance, and speech defects, and apparent inability to find enough room for the tongue. In my opinion, these patients would be better off if the lower anterior teeth were slightly irregular or possibly left a little bit on the bimaxillary protrusion side.

THE SWINGING PENDULUM

In every field there seems to be a pendulum that swings from one extreme to the other with regard to what is right and what is wrong. Standards are set up and objectives of perfection are strived for. I think that in the offices of the finest of orthodontists there has been a tendency to work toward moving the dentures distally to a greater extent than was formerly thought desirable. Before this, orthodontics went through a period in which it was thought that *all* patients could accommodate a full complement of teeth. During this period, lateral expansion and anterior expansion were accomplished with abandon. It was felt that the underlying bone would grow and develop a base for these teeth which were forced out of bounds. Distal driving of teeth was not being accomplished except in the upper arch by means of Class II elastics. Very little extraoral anchorage was being used. Most treatment involved merely the rounding-out of teeth anteriorly.

In the days of Angle, anchorage preparation as we know and practice it today was not being used. Expansion to accommodate a full complement of teeth was the goal of orthodontists of the Angle school in practically all cases. Calvin Case was severely criticized for compromising with the extraction of teeth in orthodontic treatment. He was severely criticized at meetings in which heated

discussions of treatment philosophy took place. As a general rule, he was very unpopular in a meeting where the predominant philosophy was that of treatment with a full complement of teeth regardless of the bony base or position of the teeth with respect to basal bone support.

After going through a period in which the extraction of teeth in orthodontic treatment prevailed in most offices, I think it is quite possible that we will about-face and go right back through a cycle of trying to maintain a full complement of teeth where, in many cases, a stable result is just not "in the cards."

EASY EXTRACTION TECHNIQUES

I believe that the Begg technique and other light-wire techniques which are being used in conjunction with extraction of premolars will eventually cause a revulsion to tooth extraction in orthodontic treatment. Ease and speed of treatment are the basic reasons for the wave of enthusiasm, while some of the prime objectives of orthodontic treatment are being ignored.

I hope that our judgment will be tempered by the experience of our predecessors, that Nance's famous articles will be reviewed, and that the "exceptions to the rule" will be accurately diagnosed by careful measurement of models, clinical examination of patients, and headfilm study.

MEANS USED TO GAIN ARCH LENGTH

A study of stabile treated nonextraction cases reveals that, with the exception of labial movement of mandibular incisors, all the means[2] of aligning teeth in nonrotated positions were used. (In most of the cases the lower incisors were kept behind their malocclusion positions.) However, all the means of gaining arch length were used to a very *minor* degree.

Methods of increasing mandibular arch length[2] include (1) distal movement of mandibular posterior teeth, (2) uprighting of mandibular posterior teeth which have actually tipped forward, (3) labial movement of mandibular incisors, (4) buccal expansion, and (5) rotation of mandibular molars and premolars.

The use of Class III mechanics in treating Class II cases was made popular by Tweed,[8] who used this distal force to the lower arch in conjunction with second-order bends in the lower arch wire to tip the teeth back or to put them in a position to resist anterior displacement. In other words, he reasoned that, placed in these tipped-back positions, the teeth would act much the same as tent pegs in resisting displacement.

Whether this reasoning is scientifically correct is the subject of a great deal of controversy. Many feel that this anchorage preparation merely gives the teeth a "round trip."

Regardless of who is right and who is wrong, the fact remains that Tweed and his followers are able to treat successfully the most difficult cases and to obtain a great deal of distal tooth movement in the maxillary arch by means of this prepared anchorage.

It has been observed[9] that anterior displacement of the lower molar roots is quite possible when second-order bends are used in anchorage preparation. This

is true especially if the patient becomes lax in wearing the Class III elastics. It is also true when intermittent distal force is used, as in the nightly use of headgear direct to the lower arch or when Class III elastic force supported by headgear is used only at night. *If a tip-back force is bent into an arch wire, there must also be a constant distal force to avoid anterior root displacement.*

GAINING SPACE BY DISTAL MOVEMENT

Regarding orthodontic appliances, Dewel[10] wrote:

> In the usual crowded oral occlusion, anterior teeth will tip labially on insertion of ideal arch wires in brackets on incisors. They have no place to go but forward; it is one form of undesirable expansion. The four incisors in each arch are the weakest of all teeth and they will move labially beyond the limits of basal bone, while the larger number of sturdy posterior teeth remain undisturbed. This will occur even though the crowding is moderate. Proper correction of crowded incisors calls for distal movement of cuspids and premolars before attempting to realign anterior teeth over the apical base.

To position these crowded incisors safely over apical base in nonextraction cases, lower buccal segments should be tipped back sufficiently to open the required space mesial to the lower cuspids before the lower incisors are banded.

Class III mechanics have a tendency to open the bite by extruding the upper molars. In cases of Class II, Division 2 malocclusion this is very desirable for freeing the mandible and allowing it to move anteriorly. Many of our Class I cases of crowding are of the deep-overbite type in which this bite opening is also beneficial. Extruding the upper molars facilitates easier distal movement when Class II or extraoral distal force is instituted.[5]

When it is anticipated that Class II elastics will be used in treatment, it is very desirable to tip the occlusal plane distally first so that there will not be an anterior cant of the occlusal plane when treatment is completed.[5]

In attempting to acquire arch length, it is much better to treat the patient at a younger age. If he can be treated before the premolars and canines erupt, there is much greater likelihood of permanently increasing this arch length a slight amount by expansion or uprighting of mesially tipped lower buccal segments. By tipping the lower teeth back, one can sometimes force the premolars and canines to erupt in a more distal position.

KLOEHN TYPE OF CERVICAL GEAR

In the upper arch, the Kloehn type of cervical gear is very effective in distal movement. Whether the upper molars are actually driven back by cervical gear of the Kloehn type or just inhibited from their normal forward and downward growth is a somewhat controversial matter. Regardless of controversy, however, the same things are accomplished in a growing patient. Class II molar relationship is corrected. In a Class I crowded case, the crowding is unraveled. The bodily distal movement of lower buccal teeth is very difficult after these teeth have erupted.[12]

It seems to me that increasing arch length between the symphysis and the lower first permanent molar beyond a mere uprighting of teeth and slight expansion in the molar and second premolar region is very likely to be fraught

with disappointment in most cases and that one would be wise indeed to heed the advice of Nance regarding our limitations in this regard.

BUCCAL EXPANSION

One very mysterious means of increasing arch length is buccal expansion. How much expansion can be accomplished with the expectation of its holding permanently? As Howes[11] pointed out, "When the basal arches are wide enough, but the coronal arches are not, the coronal arches can be expanded; and, if the environmental forces which would cause relapse are eventually eliminated by further growth, elimination of habits, or a new balance of muscular forces, then the expansion will be maintained. This might apply to about 20 per cent of our cases."

It was suggested that greater arch length could be gained by moving the teeth distally into a wider part of the arch.

In reviewing photographs of models in Howes'[11] article on arch width in the premolar region, I noted that in the cases in which treatment was considered successful there was a great deal more expansion in the first and second molar region than through the area of the first premolars and canines.

In a study of stabile treated cases, it was observed that in several there was an actual widening of 1 or 2 mm. in the molar and second premolar region during the functional postretention period, even though there was some lateral expansion from beginning to retention. This indicates to me that possibly we could have expanded more to begin with and thus simplified treatment in these particular cases. In none of the cases observed did lateral expansion at the lower canines occur.

ANALYSIS OF BUCCAL EXPANSION

In an effort to analyze the net gain in buccal expansion, a diagram was constructed. A divider was used, with one point placed between the lower incisors at the linguo-incisal edge and the other point placed at the mesial marginal ridge of the lower second molar in the center of the tooth (or down the central groove).

The distance from this spot at the contact point of one molar to the opposite molar was measured. These measurements were taken for the purpose of constructing a hypothetical case to demonstrate how much arch-length increase would take place with each millimeter of lateral movement at this molar position. It was mathematically calculated that the straight inside distance from molar position to incisor would increase 1.1 mm. for each 2 mm. of lateral movement. The arch length at the contact points of the hypothetical arch would increase only 0.7 mm. because the arch would not be altered past the canine or buccal segment. An increase in arch length due to lateral expansion in the canine areas, however, would be quite a different story. At this position in the arch, nearly all of the lateral expansion would increase arch length.

PITFALLS OF EARLY NONEXTRACTION TREATMENT

In borderline cases nonextraction treatment early in the mixed-dentition stage consists of remodeling the anterior portion of the arch. The length of this

portion of the dental arch is a known factor. What we are doing is borrowing from the distal portion of the alveolar trough, which at this time is an unknown quantity. We will not know for several years how much each patient is to grow in this area. As we tip first molars back, we impact second and third molars.

We must rely upon clinical judgment in estimating the potential of the patient in this regard.

In early mixed dentition cases in which there is considerable deficiency in the lower arch, it would be wise to take several pictures of the unerupted second molars to ascertain the amount of space between the crowns of the first and second molars. Also, the size and shape of the mandible should be checked in an attempt to assess the future growth to take place at the distal end.

One of the dangers of early nonextraction treatment, especially in growing patients, is overtreatment of upper incisors.

In cases of Class II malocclusion or crowding in which there is a normal or ideal (Steiner-Holdaway[7]) apical base relationship before treatment or a tendency toward very straight profile, it is imperative that cervical gear or other distal forces be used to correct the molar relationship; caution should be used, however, in torquing back the upper incisor roots early in treatment. As the mandible grows forward, the axial inclination of the maxillary incisors will increase. One should attempt only to maintain the original labiolingual axial inclination as the teeth are moved distally. It is quite possible in these cases to change a Class II apical base relationship to a Class III relationship.

Another pitfall in this early nonextraction treatment is length of treatment. One must plan these cases in two stages—one in the mixed dentition and the other in the permanent dentition. If the secondary treatment is not necessary, everyone will gain. If it becomes necessary, it is usually of a simple nature when the proper preliminary treatment has been given.

SUMMARY

1. Space can be gained by uprighting mesially tipped lower buccal segments.
2. The use of Class III mechanics is very desirable in the treatment of a majority of orthodontic problems.
3. Early treatment is very beneficial in cases in which arch length is a problem.
4. Lateral headfilms are valuable in diagnosis and treatment planning, and the tracing of these films should not be delegated to auxiliary personnel.
5. Indiscriminate use of easy extraction techniques and abuse of anchorage will eventually cause a revulsion to extraction in orthodontic treatment.
6. In the usual crowded oral occlusion, anterior teeth will tip labially on the insertion of arch wires in brackets on incisors.
7. Increasing of arch length between the symphysis and the lower first permanent molar beyond a mere uprighting of teeth and expansion in the second premolar and molar regions is likely to bring disappointment in most cases.
8. Lateral expansion at the posterior end of the dental arch does not increase arch length in the same proportion as lateral expansion in the canine region.

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DISCUSSION BY GEORGE W. HAHN, SEATTLE, WASH.

If the chairman of the Program Committee wanted a critical discussion of this paper, dissenting from the views of the author, he should have found someone else, for I find myself in almost complete agreement with what Dr. Miller has so well presented.

For more than twenty years the specialty of orthodontics has been bombarded with papers, clinics, and even postgraduate courses extolling the advantages for well over 50 per cent of the patients, of a dentition minus four premolars. What were these advantages? First, as a result of personal preference or geometric formulas, we were to be able to provide a flat face built to a preconceived pattern in an immature child. Second, we were assured that alignment of the remaining teeth would cause our retention problems to disappear. Now the chickens are coming home to roost. Our girls and boys have grown up. The mouth and lips, which in many children are normally protrusive, have been distally positioned while the nose and chin have continued their normal forward development. Consequently, as these youngsters reach maturity many of them have developed the edentulous look of old age, which a full complement of teeth would have prevented.

What about retention? Five years out of retention, orthodontists not only are still struggling with relapses in the lower anterior region but, in addition, are faced in too many cases with broken contacts and spacing in both the upper and lower dental arches.

There is a place for extraction in orthodontic treatment, but it should be used only as a last resort. As much thought and consideration should be given this plan of treatment as is given in the case of the patient with a Class III malocclusion who, since correction by conventional methods is impossible, becomes a candidate for mandibular resection. Too many of us today pick up a set of models and a headfilm and outline our plan of treatment on the basis of six short words: "Do we or don't we extract?"

Referring to that part of Dr. Miller's paper relative to the distal movement of lower molars, I have never been able to comprehend why, in the attempt to move lower buccal teeth distally either to create more arch length or to set up anchorage, it is necessary to use Class III intermaxillary ligatures backed up by a Kloehn type of headgear to the upper arch.

In doing this we are complicating our treatment by the use of two mechanical devices when one would suffice. It is such a simple matter to apply extraoral anchorage directly to the lower arch, eliminating entirely the Class III intermaxillary ligatures, that I cannot understand why this method is not more generally accepted.

With reference to Dr. Miller's treatment of lower first molars, if these teeth are to be moved distally and this movement is to be attempted by tipping, this should be done at an age when the second molars are well down in their crypts. Should they, in their upward and forward eruptive path, have arrived at the position where the mesio-occlusal angle is nearing contact with the distal bulge of the first molar, impaction of the second molar is almost a certainty.

I must take issue with Dr. Miller in one statement that he has made: "Expansion to accommodate a full complement of teeth was the goal of orthodontists of the Angle school in practically all cases." This may have been true in the earlier days when the appliances used were the round labial arch followed by the pin-and-tube appliance. With the introduction of the ribbon arch appliance in 1916, however, expansion became a "bad word" in the Angle school. One of the valuable features of the ribbon arch was the control of distal tipping force in the molars, implemented by torque force in the anterior teeth. When the edgewise mechanism was introduced in 1925, the inclusion of the premolars both increased the potential anchorage at our disposal and simplified the distal movement of buccal teeth.

Since this discussion was written, there have appeared in the July, 1961, issue of the *Angle Orthodontist* two papers written in the same philosophic vein as this one by Dr. Miller. One is by R. H. W. Strang and the other is by Dr. Howard Buchner. I recommend that every orthodontist, especially those who have been in practice less than twenty years, go home and study these articles. From the discussion of Dr. Buchner's paper by Chester Wright I have lifted the following quotation: "It may be disturbing to some that they can no longer put all their problems into a single worry, the worry of creating a double protrusion. It is high time to begin worrying just as much about creating a double retrusion."

Dr. Miller has given us a very timely paper, and one to which we all should give more than a passing thought.

Skeletal disturbances: significance in orthodontic treatment

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THE SKELETAL disturbances here briefly discussed include some that are associated with endocrine and nutritional diseases and some that are of unknown origin. The teeth and their supporting structures often are affected. This may be manifested by abnormalities in form and size of the jaws and in poor quality of the bone. The teeth also may have structural defects, and their development and eruption may be accelerated or retarded. The presence of one or more of these abnormalities may introduce complications and problems that concern the orthodontist.

ENDOCRINE AND NUTRITIONAL DISTURBANCES

Any quantitative change in the hormones secreted by the endocrine glands, be it underproduction or overproduction, may lead to disturbances in metabolism of bone and dental development.

PITUITARY GLAND. If hyposecretion of the growth hormone of the pituitary gland has its onset during childhood, dwarfism results (midget). Development of the teeth is retarded. The jaws are dwarfed, but the teeth tend to attain normal size. As a result, there may not be sufficient space for all the teeth to erupt into their normal positions in the arch.

If hypersecretion of the growth hormone has its onset early in life, giantism results. There is a relatively uniform overgrowth of all parts of the body; however, as a result of the persistence of endochondral ossification of the condyles, the length of the rami is increased disproportionally. This leads to supraeruption of the teeth followed by apposition of bone at the alveolar crest, which in-

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creases the height of the mandible. This causes enlargement of the entire mandible and a marked prognathism.

THYROID GLAND. Hypothyroidism that is present at birth or has its onset during infancy or early childhood leads to dwarfism (cretin). As in the pituitary dwarf, development and eruption of the teeth are retarded, and the small, underdeveloped jaws may not provide sufficient space for all the teeth to erupt.

Hyperfunction of the thyroid gland, in contrast to hypofunction, accelerates skeletal growth, including development and eruption of the teeth. The jaws attain a normal size, but often there is an associated osteoporosis, which should be considered and evaluated if orthodontic treatment is contemplated.

PARATHYROID GLANDS. The outstanding feature of interference with dental development caused by hypoparathyroidism that has its onset early in life in hypoplasia of enamel. If the crown has already formed, the hypoplasia may be evidenced by short, underdeveloped roots. In many instances, teeth with enamel hypoplasia become ankylosed and fail to erupt.

In hyperparathyroidism, one change that may take place is osteoclastic resorption of bone and replacement of normal cellular and fat marrow by fibrous tissue. When the fibrosis is extensive, the teeth become mobile and tend to migrate.

ADRENAL GLAND. An overproduction of androgenic hormone from the adrenal cortex at birth or early in childhood causes precocious growth, including premature development and eruption of the teeth. Eruption of the teeth follows a normal pattern, and apparently no abnormalities of occlusion can be attributed to the disease.

Excessive administration of cortisone or other related effective adrenocortical hormones may produce osteoporosis and rarefaction of bone.[1] The ensuing changes in bone are attributed chiefly to decreased formation of osteoid tissue. Possibly the administration of excessive amounts of cortisone or one of the newer synthetic analogues to a patient undergoing orthodontic treatment may influence the outcome of such treatment.

RICKETS. Rickets is an osteomalacia that occurs during childhood and is caused by a deficiency of vitamin D. It affects primarily the growing skeleton, largely through failure of osteoid tissue to calcify properly. The bones remain soft and are prone to bend. When the disturbance has its onset in infancy, it is often associated with hypoplasia of the enamel and with dentinal dysplasia. In tardy rickets (resistant rickets), in which the clinical symptoms appear at about 4 to 6 years of age, hypoplasia of the enamel may be absent. However, development of the roots is retarded, the acellular cementum may be defective, and there is no cellular cementum. In some instances, degeneration and inflammation of the dental attachment apparatus occur, and not infrequently a pericemental abscess forms.

SKELETAL DISTURBANCES OF UNKNOWN ORIGIN

Several disturbances of the skeletal structures are of unknown cause. Inheritance factors play an important part in some of them, and congenital abnormalities generally are more severe. Three such conditions in which dental

abnormalities may be a prominent feature are osteogenesis imperfecta, osteopetrosis (Albers-Schönberg disease), and cleidocranial dysostosis.

OSTEOGENESIS IMPERFECTA. Osteogenesis imperfecta, sometimes referred to as congenital osteoporosis, is characterized primarily by brittle bones. It may be associated with blue scleras, deafness, and dentinogenesis imperfecta. Two forms of the disease usually are described: (1) the fetal, or infantile, form and (2) the adolescent, or tardy, form. The fetal form is likely to be severe, and those afflicted seldom survive into adulthood. In the tardy form a wide spectrum of severity exists, and many patients live to old age. When dentinogenesis imperfecta is present, the roots of the teeth tend to be short and tapered; this, in the presence of osteoporosis, suggests an unfavorable outcome for orthodontic treatment.

OSTEOPETROSIS (ALBERS-SCHÖNBERG DISEASE). Osteopetrosis is characterized by a generalized osteosclerosis caused by faulty differentiation of hematogenic and osteogenic tissue. The marrow cavity may be encroached upon to the point of obliteration, and the purposeless arrangement of the bone trabeculae results in bones that are fragile. Clinically, the disease is usually divided into two forms: (1) an infantile, or malignant, form and (2) an adult, or benign, form. The benign form follows a relatively slow course and may be compatible with normal living. In some instances the roots of the teeth are abnormally short and the cementum is sparse and of irregular thickness.[2] The result of applying orthodontic force to a tooth with faulty cementum in the presence of sclerotic bone would be uncertain.

CLEIDOCRANIAL DYSOSTOSIS. In cleidocranial dysostosis, abnormalities of the teeth and jaws are an almost constant feature. The disease is characterized by underdevelopment of the maxilla, prolonged retention of the deciduous teeth, failure of eruption of many of the permanent teeth, supernumerary teeth, and absence of cellular cementum. Perhaps no other condition presents a more complex problem to the orthodontist. It involves correction of a malocclusion that results from a discrepancy in size of the maxilla and the mandible, and working with bone, particularly the maxilla, that is of poor quality. Cellular cementum is lacking on the erupted as well as the unerupted teeth.[3] The question would then arise as to how vulnerable to resorption the roots of such teeth would be when orthodontic force is applied. Removal of supernumerary teeth that interfere with the movement of erupted as well as unerupted teeth is perhaps the most minor problem.

CONCLUSION

Orthodontists should be familiar with the prognosis of the skeletal disturbance with which they are dealing, since some are amenable to treatment while others are not.

Abnormalities of the jaws and teeth may be so complex in some instances that one cannot expect orthodontic treatment to give a perfect result. In certain cases, however, corrective measures will help obtain reasonably good occlusion and function. A most difficult problem to deal with is that of an inferior at-

tachment apparatus caused by a combination of faulty cementum and alveolar bone of poor quality.

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Letterer-Siwe type of reticuloendotheliosis

Case report on orthodontic interrelationship

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IN JULY, 1951, when the boy shown in Figs. 1 to 8 was 15 months of age, he was found to have an eosinophilic granuloma of the left tibia. When he was hospitalized, examination revealed many areas of osteolytic bone changes, and the diagnosis of reticuloendotheliosis was made. The patient received x-ray therapy, nitrogen mustard, Aureomycin, cortisone, and antibiotics over a long period of time. As the disease progressed, the boy was again hospitalized in 1952, when a diagnosis of Letterer-Siwe type of reticuloendotheliosis was made. In 1954 he developed diabetes insipidus, which responded to x-ray treatment. During the course of the disease and therapy, the mandible was completely invaded and most of the deciduous teeth were extracted. There was no regeneration of the mandible. When the patient was 12 years 3 months of age the diagnosis of inactive Letterer-Siwe type of reticuloendotheliosis was confirmed.

This patient was started on x-ray therapy in July, 1951, at the age of 15 months, and received x-ray treatment to various parts of the body. The right and left sides of the jaws were given 600 r. In July, 1952, he was given 950 r to each side of the neck; the mandible also received some x-ray treatment at that time. During the autumn of 1952, he again received x-ray therapy, but none was directed over the maxilla or mandible. The last x-ray therapy, given in 1954, was to the frontal area and also to the pituitary fossa. The fossa received 650 r on each side. These treatments were given with a 250 kv. machine and a thorium filter which gave maximum protection to the skin and underlying soft tissue.

A recent physical examination reveals a short boy, of less-than-average stature, aged 12 years 3 months. There is a marked droop of the right shoulder, which is lower than the left. Both shoulders are rounded. The cervical area is

Presented before Hope Haven Hospital Diagnostic Clinic, April 26, 1961.

Fig. 1.

Fig. 2.

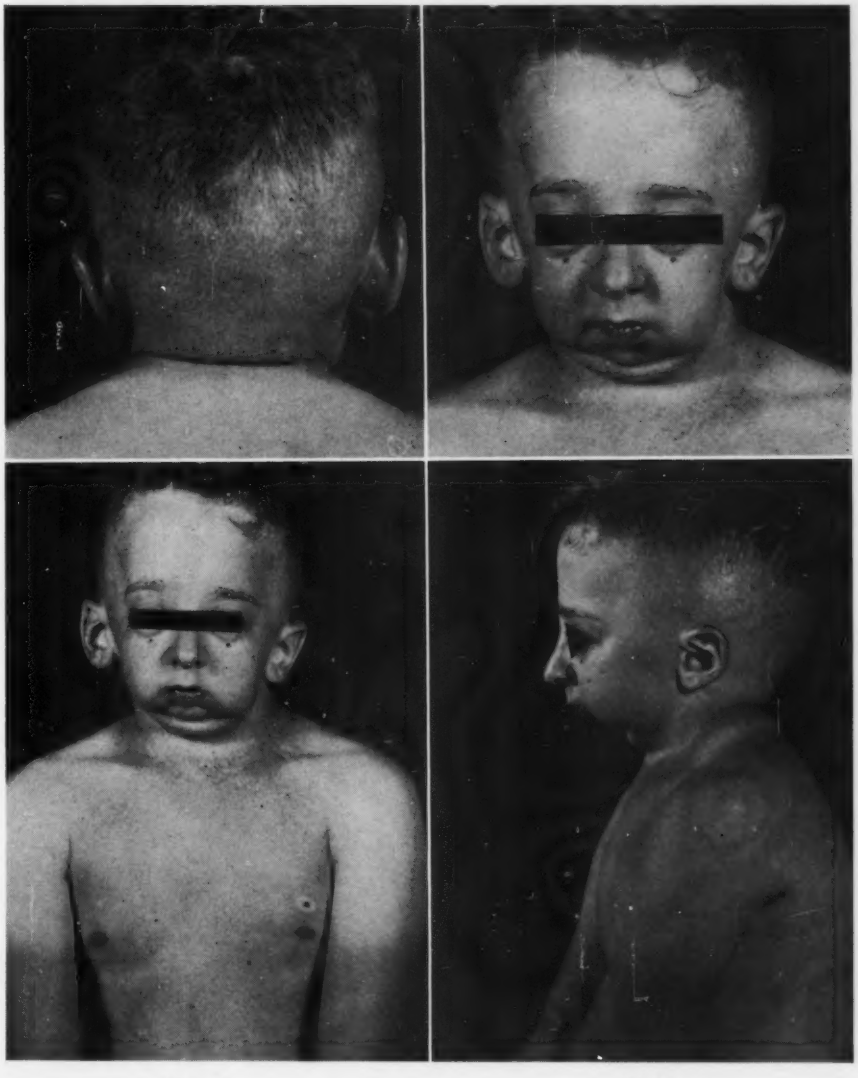


Fig. 3.

Fig. 4.

Figs. 1 to 4. Patient L. E., aged 12 years 3 months.

shorter than is usually seen. A definite exophthalmos is present. Cranial proportion is generally good. The chest is clear, and the heart and abdomen are normal. The testicles show maturation, and pubic hair is present. The extremities are normal at this time.

Hospital clinical discussion concerning the objectives of esthetic and functional craniofacial improvement to be gained through possible plastic repair of the mandible led to an orthodontic consultation and evaluation.

The boy shows extreme micrognathia. Both maxillary and mandibular anteroposterior and lateral dimensions are markedly deficient. The chin is deviated to the left. The infrahyoid muscle groups, acting strongly, deflect the mandible

Fig. 5.

Fig. 6.

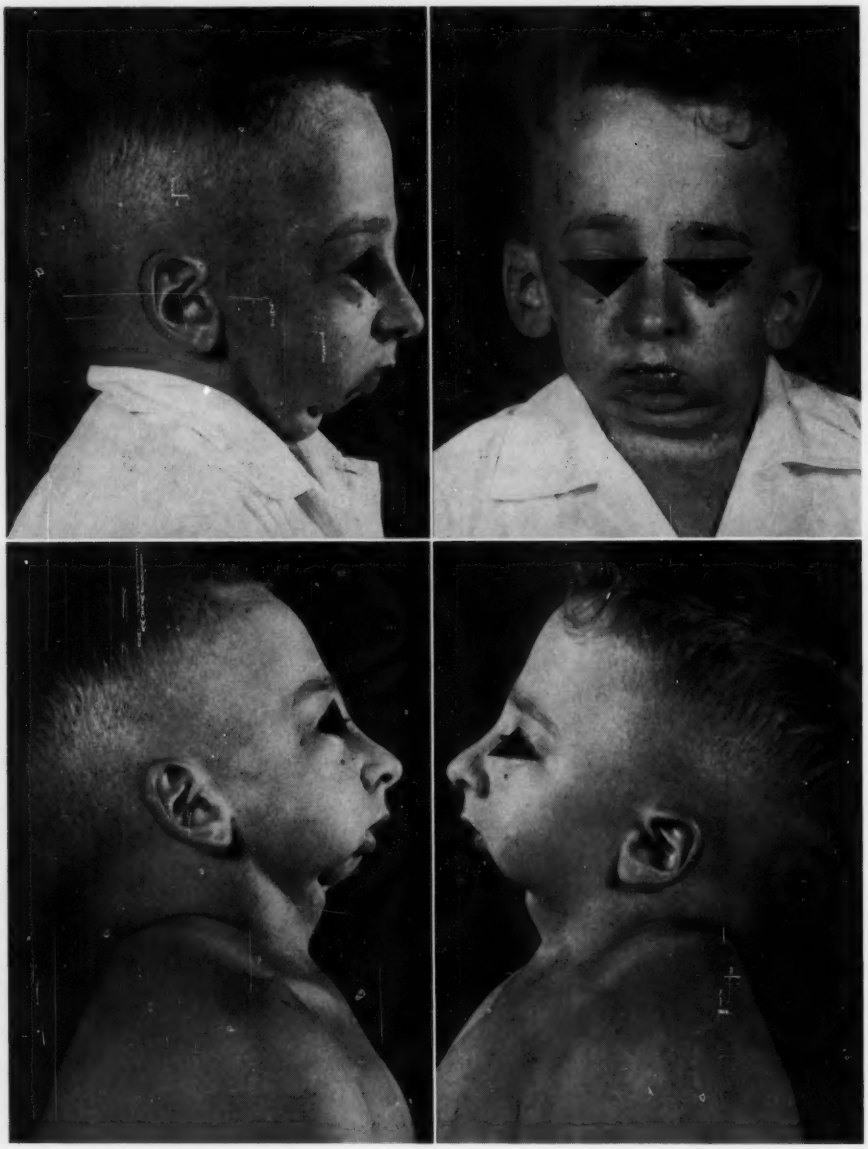


Fig. 7.

Fig. 8.

Figs. 5 to 8. Patient L. E., aged 12 years 3 months.

and hyoid posteriorly and inferiorly. The hyoid bone could barely be palpated low over the sternum. Perioral musculature is tensed.

The maxilla is diminutive, poorly formed, and relatively flat. Poorly formed rudimentary maxillary permanent teeth with shortened roots and a fully formed mottled carious maxillary right central incisor are present. An anterior mandibular segment is present which contains an incompletely formed, partially erupted, mandibular right canine and four fully formed mandibular central and lateral incisors. X-ray examination, however, shows the root formations

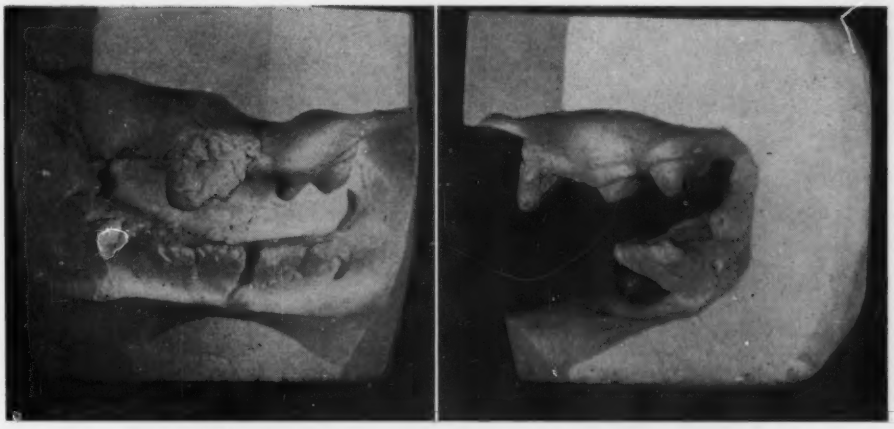


Fig. 9. Fig. 10.

Figs. 9 and 10. Patient L. E., aged 12 years 3 months. Models showing dental and craniofacial relationship.

of these teeth to be deficient (Figs. 9 to 12). These four teeth, lying in a horizontal plane, are contained in a segment that is loose except for a fibrous connection and sequestered from the poorly formed mandible. Mandibular lateral and anteroposterior growth is markedly restricted.

At the time of the recent examination poor oral hygiene and halitosis were evidenced, but there were no lesions of the oral mucous membrane. The hard palate is narrowed laterally and anteroposteriorly. The soft palate appears to rise and fall during function. The oral pharynx at rest is apparently obliterated by approximation of the tongue, soft palate, and pharyngeal pillars.

No definite glenoid fossae, mandibular body, rami, temporomandibular joints, and maxillary sinuses are seen roentgenographically (Figs. 11 and 12). Marked deformity of the maxilla and teeth, retrobulbar compression, improper

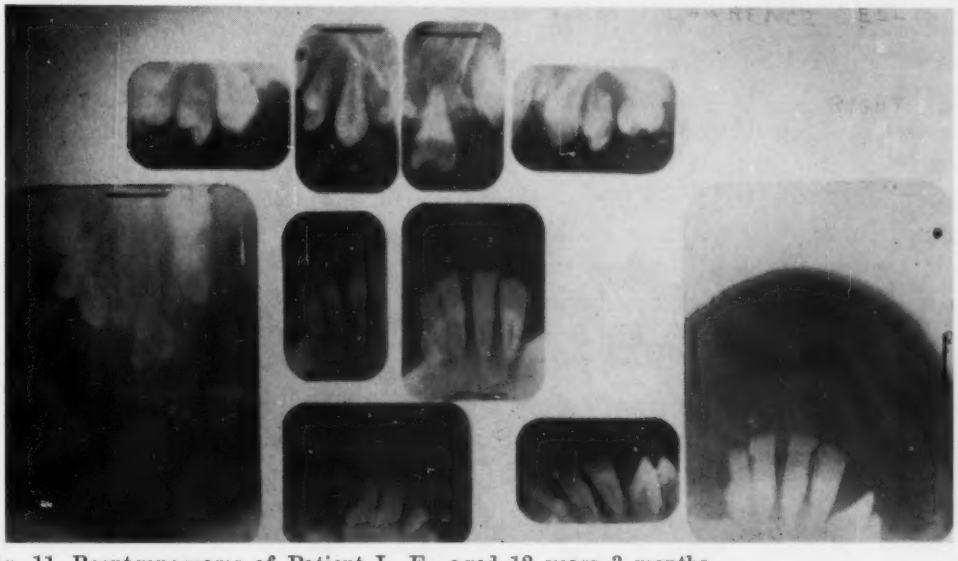


Fig. 11. Roentgenograms of Patient L. E., aged 12 years 3 months.

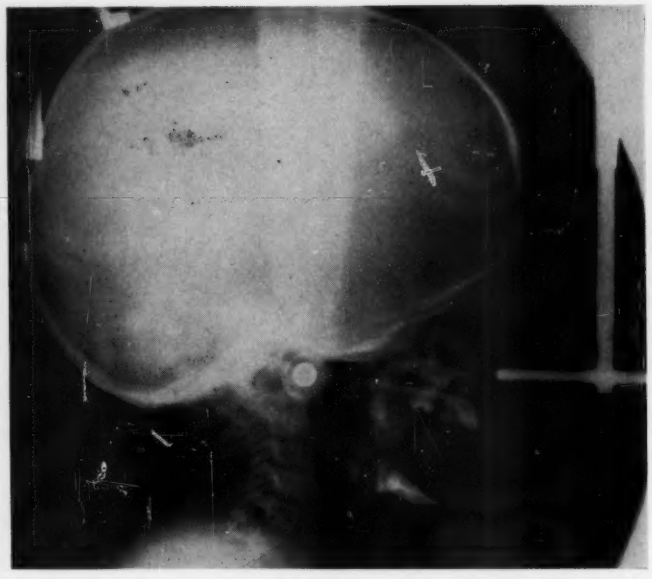


Fig. 12. Roentgenogram of Patient L. E., aged 12 years 3 months.

vertical development of the middle cranial fossa, and a poorly outlined sella turcica are demonstrated roentgenographically (Figs. 11 and 12). The condyloid and coronoid processes of the vestigial mandible, the glenoid fossa, and the temporomandibular joint cannot be palpated on either side. However, the definite masseter and temporal contraction can be felt, particularly on the right side. This would indicate a functional (fibrous?) pseudotemporomandibular joint on the infratemporal surface.

Definite movement is felt bilaterally anterior to the place where the temporomandibular joint is customarily seen. Intraorally, an oblique vertigial "ascending ramus" can be palpated bilaterally; this is more prominent on the right side than on the left. During mandibular closure, intraoral palpation reveals that this "ascending ramus" moves posteriorly and superiorly, apparently pivoting at its superior end. The mandibular permanent central and lateral incisors are hinged upon the sequestered vestigial segment of the alveolar process and follow the general mandibular position during swallowing. The tongue is strong and evidently has a thrusting action. During swallowing the mandibular segment, including the four incisors and canine (Figs. 9 and 10), moves labially, apparently as a result of tongue-thrusting, into a more horizontal plane than does the rudimentary mandible itself.

The tongue is strong, highly mobile, large, and wide, and it overflows the mandibular anterior teeth. The floor of the mouth, particularly the myohyoid region as palpated from above, seems strong and functional during mandibular movement in swallowing. The buccinator muscle lacks strength but apparently is functional. Mastication is accomplished by strong tongue action against the rudimentary mandible, the "floor of the mouth," the maxilla, the anterior mandibular section to which the five mandibular anterior teeth are attached, the

cheeks, the lips, and adjacent musculature. Definite muscle action of the masseter can be observed bilaterally; apparently it attaches to the rudimentary descending ramus. The masseter originates from a deep attachment upon the zygomatic arch medially and posteriorly, apparently gaining its diagonal insertion near the lateral and inferior border of the rudimentary "ascending ramus."

Strong orbicularis oris function is definitely observed, with the inferior portion being shortened and less functional. Facial musculature generally is flaccid. Genion is directed downward and forward markedly in an anteroposterior vertical plane with the posterior rim of the orbit.

Swallowing is accomplished with difficulty and is of a visceral type. The infrahyoid group of muscles contracts strongly with swallowing, the rudimentary chin point on the mandible moving more backward than downward during the swallowing action.

The hyoid is located slightly below the rudimentary mandible in the median sagittal plane. The attachment from the hyoid to the sternum is extremely short because of the depressed position of the chin. The chin deviates to the left approximately 1 cm.

Speech, while articulate, is constantly modulated in tone, with projection of sound lacking. However, it is possible for this patient to speak very loudly. The impression is given that the patient feels he lacks control of his voice and that his restraint in speaking is psychological.

The mother reports that the patient had a normal infancy until the age of 15 months, when an eosinophilic granuloma of the left tibia was discovered. She reports that between the ages of 3 and 5 years, the left leg was ¼ to ½ inch shorter than the right. The patient has since outgrown this deformity. Orthopedic shoe lifts were used until he was 8 years old, and the difference in leg length was gradually compensated for during growth.

Photographs of the boy to the age of 2 years show a round, babyish face, oval in shape. Facial characteristics were balanced, with a possible slight mandibular deviation to the left. Heavy mental furrows are noted. Mild deviation to the left is evident in photographs taken when the boy was about 3 years of age. Between the ages of 3 and 4 years a marked mandibular retrusion became evident. Exophthalmos became evident at approximately 4 to 5 years of age. A shortening of the neck was seen at the age of 4 years. At the age of 6 years mandibular deviation to the left increased and was accompanied by increasing exophthalmos. The mandibular retrusion became increasingly severe between the ages of 6 and 8 years, with the fullness of the buccal areas following the adolescent adipose pattern. Deviation of the chin is to the left, occasionally moving toward the midline. A marked increase in the depth of the mental furrow and retrusion of the mental area (deviated strongly to the left) and shortening of the infrahyoid group becomes evident in photographs of the patient between the ages of 9 and 10 years. These symptoms increased toward the age of 11 years, as shown in the photographs.

The mother reports that the patient's diet is varied and includes all foods except those that remain hard and fibrous after special preparation.

His sixth grade teacher reports that now, as in the past (according to information from his previous teachers), the patient is a well adjusted A-B student who is liked by all his classmates.

RECOMMENDATIONS

Plastic repair of the temporomandibular joint in this case would appear impractical for the following reasons:

1. Rudimentary underdevelopment structures are related.
2. Growth potential is not at a high (or even "normal") level.
3. There is no irregular osseous stabilizing area on the infratemporal surface of the temporal bone upon which to reconstruct a simulated temporomandibular joint with any reasonable expectation of satisfactory function.
4. At present there is a satisfactory simulated functional temporomandibular joint.
5. The tensed perioral and infrahyoid musculature is displaced posteriorly and functionally shortened, which would interfere with and displace posteriorly any interposed mandibular implant.
6. This patient has acquired practical masticatory functional balance.
7. The postoperative dietary imbalance introduced by surgical interference could result in unsatisfactory altered masticatory function.

The following procedures appear constructive:

1. Dental hygiene should be regular and more effective.
2. Cleaning of the teeth and periodontal care should be done and repeated each four months.
3. Carious areas should be eliminated.
4. The carious protruding maxillary right central incisor should be extracted.
5. Speech therapy should be given.
6. Surgical reconstruction of the temporomandibular joints may prove of dubious value.
7. At the age of 17 to 18 years, after removal of the mandibular anterior section containing five attached permanent teeth, a surgical prosthesis or bone implant fixed firmly anteriorly against the mandible might be considered practical. The size and placement of this implant should be in harmony with the maxillary arch and within the adjusting limits of the perioral and infrahyoid musculature. Possibly, to remain within tolerance of this musculature, performing this surgical procedure in two stages might be constructive. Subsequent myofunctional training and speech therapy would be beneficial. Subsequent extraction of all maxillary teeth and placing of a prosthetic restoration could somewhat improve dental functional efficiency.

DISCUSSION

In viewing the over-all evaluation,[1] there may be interrelated a neurogenic deficiency dating from early embryonic development when the time "organizer hormones"[3] were operating in the embryonic stage.[2]

The freeing of perioral, masticatory, facial, suprahyoid, and infrahyoid muscles to encourage movement and thus aid growth of the organs of mastication was considered but was not recommended because this boy apparently lacked basic growth potential.

SUMMARY

Delaying plastic surgery repair until the patient reached the age of 17 to 18 years was suggested[1] so that the growth potential would be practically exhausted, even though clinically significant mandibular improvement with growth is not anticipated or expected.

This appeared to be primarily a case for plastic surgery rather than for orthodontic guidance. The history and physical examination, along with the presence of only rudimentary mandibular and maxillary development, indicated that little maxillary and mandibular growth potential was present or had been present.

REFERENCES

1. Salzmann, J. A.: Personal Communication.
2. Willis, R. A.: The Borderland of Embryology and Pathology, London, 1958, Butterworth & Co., Ltd., pp. 4-6.
3. Wilkins, Lawson: Diagnosis and Treatment of Endocrine Disorders in Childhood and Adolescence, ed. 2, Springfield, Ill., 1957, Charles C Thomas, p. 4.

Biology, orthodontics, and the modification of man

TIME was when orthodontists, realizing the importance of dentofacial growth and development to the success of their ministrations, would speak in a vague way of biologic entailments. According to fashion, certain essayists would be invited to speak on this subject. After holding forth in general terms, the essayist would draw the curtain on "science" and speak about "practical matters." Seldom was any true correlation between growth and development and clinical orthodontics demonstrated. This was inevitable because of the paucity of knowledge on this subject. Progress has been achieved since those days.

On page 881 of this issue of the JOURNAL is published the second John Valentine Mershon Memorial Lecture in which Professor L. J. Baume of the University of Geneva, Switzerland, discusses "Principles of Cephalofacial Development Revealed by Experimental Biology." Professor Baume quotes Jean Rostand, the eminent French biologist, on experimental biology in laboratory animals which demonstrate hitherto unknown somatic change. Ten years later, however, in 1959, Rostand* published "Can Man Be Modified?" Here he speaks about man and no longer limits his remarks to experimental animals.

"Of course man can be changed," says Rostand. "We shall not concern ourselves here," he continues, "with the question whether man has possibilities of becoming taller or more robust or more handsome, whether he can accentuate the shortening of this jaw to an extent that would rid him of his wisdom teeth . . ." These accomplishments he takes for granted. He is concerned not with somatic changes but with attempts to make man "more human," from the psychic point of view. Orthodontists have always worked on the assumption that man can be changed. They dare not think otherwise if they wish to stay in practice.

In the study of man, Rostand adds, "The three cardinal problems of biology—the problem of how a living creature grows, the problem of how species

*Rostand, J.: Can Man be Modified? London, 1959, Secker and Warburg.

evolve, the problem of how life originated—have been scarcely touched by the scientists.'' Professor Baume points out, ''The fundamentals of oral biology have evolved only recently.'' However, a start has been made.

We do not as yet know the basis of growth and development. For example, we have no knowledge of how cells differentiate into different types and eventually into organs. What brings about growth and cessation of growth? The manner in which inheritance actually controls and dictates growth and development is unknown. Whether and when this is accomplished through hormonal or nutritional control is still beyond our ken.

Desoxyribonucleic acid (DNA) found in the genes dictates the specificity of protein synthesis. DNA molecules contain all the information required to specify the inheritable characteristics of an organism. ''DNA is the vehicle for the continuity of life,'' says Commoner.* ''However, the information it conveys still awaits translation.'' When we come to understand the molecular aspects of biology which embrace biochemistry, biophysics, and bioengineering, then it is believed that we shall be able to make ''some startling discoveries.''

Does this refer to actual creation of life? Those working in biochemistry have found that living bodies cannot be analyzed beyond the cell stage. There is a difference between the living cell and the chemical components of which it consists. We may know of what man consists, but we can not create man by compounding the ingredients. The key is still missing. What makes life is still unknown.

The study of static anatomy as a basis for the understanding of human growth is obsolete. Function is recognized as the prime factor in growth studies. The study of form and function as explained by D'Arcy Thompson promises to produce the next breakthrough in understanding child growth and development. The body has many vestigial organs which became vestigial when their importance in the physiologic complex waned and then disappeared altogether. The purpose for which the stomatognathic system is used determines its form. The use and abuse of our chewing apparatus, in addition to evolutionary changes, are the cause of many of the malocclusions that we find in modern man in contradistinction to its rarity in primitive man.

Growth of the facial skeleton, as Baume explains, is effected at the synchondroses of the cranial base responsible for lengthening of the skull. The condylar cartilages direct the growth of the mandible. Forward development of the facial bones is induced partly by the activity of these cartilage centers. The intramembranous bones are extremely plastic. The plasticity of membrane bones, such as those of the face and jaws, renders these especially subject to genetic, environmental, and physiologic changes, including induced abnormal pressures. How the character of these bones can be used to help us in orthodontic therapy still remains to be determined.

The benefits of early orthodontic intervention are made clear if we understand the plasticity of the bones of the face and jaws. Baume refers to the

*Commoner, B.: In Defense of Biology, Science 133: 1745-1748, 1961.

condylar cartilage as secondary cartilage which is highly responsive to mechanical stimuli, while cartilage in long bones is not so constituted.

The foregoing may give us the answer to the results obtained by means of the activator appliance and the Oliver guide plane, which acts in a similar manner in stimulating forward mandibular growth. Much is still to be learned. It is not enough to differ with orthodontic procedures because one does not quite understand how they work. We must adopt a mature, tolerant attitude toward those whose dicta are not in keeping with what is presently accepted as "conventional wisdom" or conformity with popular thought.

J. A. S.

The Philadelphia ad interim meeting of the Board of Directors of the American Association of Orthodontists

UNDER THE leadership of Dallas R. McCauley, president of the American Association of Orthodontists, the Ad Interim Committee of the A. A. O. held a meeting at the Warwick Hotel in Philadelphia on Oct. 14 and 15, 1961, immediately preceding the annual meeting of the American Dental Association.

Some of the actions of this meeting are pointed out in a letter from A. A. O. Secretary Earl E. Shepard. The letter, addressed to the secretaries of the sectional societies, contains the following information:

1. It will be of interest to you to know that an Executive Secretary has been employed in the person of Mr. James Brophy who is currently the Executive Secretary of the St. Louis Dental Society. It will obviously take some time for the complete transition to be effected.

2. It has been suggested by the Military Affairs Committee of the A. A. O. that the various local draft boards be appealed to should there be a disposition on their part to interrupt the training of an orthodontist, be it in a formal university graduate course or in preceptorship.

3. It is suggested that encouragement be offered at the constitutent level to all members to avail themselves of the Group Accident Insurance Plan which has lately been offered to the membership, the response to which has not been as enthusiastic as had been anticipated.

4. It is realized that the terms of most Qualifying Committee members are staggered to prevent a completely new committee being brought in annually. This practice is highly advisable for the efficient examining and direction of the preceptorship program.

5. In order to provide for the most complete coverage on historical research within the A. A. O., the Board of Directors suggests that appointment of a historian on the constituent level who will serve as a liaison between the A. A. O. and the constituent society.

6. To provide liaison between other specialty groups, the Related Organizations Committee was very busy during the Philadelphia meeting. It was suggested by the Board of

Directors that a Constituent Society Committee of like description be appointed in order to provide liaison on a state and sectional level.

7. There have been suggestions regarding committee consolidation, the details of which will be forthcoming when the verbatim minutes of the Philadelphia Board of Directors meeting has been transcribed.

Believing that you as well as your Directors should be informed on all things pertaining to this meeting, you will be supplied with a copy of the minutes when they have been made available by the stenotypist. If this office can be of any further help to you, please contact us at any time.

RESOLUTION #2

The A. D. A. Liaison Committee of the A. A. O. (William S. Smith of California, chairman) reported to the Ad Interim Committee in Philadelphia that the committee is unanimously agreed that the A. A. O. should support Resolution #2 as read by Nat Gaston, then chairman of the Committee, at the meeting of the A. A. O. in Denver in April, 1961.

Resolution #2 was adopted by the A. D. A. House of Delegates in Philadelphia. The text of the resolution, which is self-explanatory, follows:

> 230. *Resolved,* that after January 1, 1965, all members of the Association who have not previously announced limitation of practice and who desire to announce themselves as limiting their practice exclusively to one of the areas approved by the American Dental Association be required to complete two or more academic years of advanced education as specified by the certifying boards, essentially all of which must be in or directly related to the selected area, or to possess a state license permitting announcement in an area approved by the American Dental Association.

This, then, constitutes the final action of the A. D. A. on the so-called Resolution #2, which has been under discussion by all of the specialties for a period of more than two years.

H. C. P.

DEPARTMENT OF ABSTRACTS AND REVIEWS

Edited by DR. J. A. SALZMANN, *New York City*

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City.

Agnathia Associated With Pharyngeal Isthmus Atresia and Hydramnios

By Warren W. Johnson and John B. Cook, III. Arch. Pediat. **78**: *211-217, June, 1961.*

Since the description by Treacher Collins, in 1900, of the clinical manifestations of mandibulofacial dysostosis, numerous variations of malformation of the first pharyngeal arch have been observed. These include micrognathia with ptosis of the tongue, described by Pierre Robin in 1923, cheiloschisis and cleft palate, malformation of the external and middle ears, micrognathia (or mandibular hypoplasia), hypoplasia of the mandible with cleft palate as described by Callister in 1957, bifid tongue, hypertelorism, congenital deaf-mutism, unilateral underdevelopment of the mandible, and slightly abnormal development of any portion of the first pharyngeal arch derivatives.

The case of a premature infant with complete absence of the mandible and atresis of the pharyngeal isthmus, with associated vascular anomalies, is presented.

A review of the development of the concept of first pharyngeal arch malformations is given, with mention of the hereditary predisposition and possible importance of maternal gestational factors to such lesions.

The association of hydramnios with congenital anomalies is observed, with special emphasis on certain types of malformation.

A Functional Approach to Craniology

By Melvin L. Moss and Richard W. Young. Am. J. Phys. Anthrop. **18**: *281-292, December, 1960.*

The development of neurocranial form, both normal and abnormal, occurs within an interacting functional matrix consisting of the cerebral capsule, skull base, and meninges. While the neural mass provides the magnitude of the neurocranial growth vectors, their direction is determined by the maturing skull base and meninges. Cerebral form is the resultant of these forces. Sutural location, morphology, and patency also reflect the functional matrix within which they exist. The presence or absence of supraorbital ridges is only a reflection of the spatial relationship between two functionally unrelated cephalic components —the orbit and the brain case—both of which are served by the frontal bone, of

which the external and internal tables and the diploe respond to differing functional demands.

The form of the skull is related to its functions. All bones primarily serve to protect and support soft tissues. The skull arises and matures as part of a functional complex of tissues, brain, orbital contents, muscles, meninges, tongue, teeth, and oral, nasal, and pharyngeal cavities. Cranial form closely reflects the functional demands of these soft tissues throughout life.

Functional cranial components are not to be confused with isolated morphologic entities, such as individual bones. While a single bone may form a functional component in itself, these components may also include several bones or only portions of a single bone.

The cerebral capsule is formed by the tissues which surround, and are intimately responsive to the functional demands of, the neural mass. Both the size and the shape of the inner surface of the osseous cranial vault are determined by the form of the dura which, in turn, is a direct reflection of the form of the brain.

Components of the facial skeleton, such as the nasal bones, are not affected by alterations in the cerebral capsule. With regard to the base, the essentially plane relationships of midline structures are not disturbed, but the cerebral fossae are correspondingly larger or smaller. A current study of micro- and macrocrania in man shows that the same principles are operative in the postnatal development of the human skull.

As the rate of brain growth lessens, the absolute rate of capsular expansion correspondingly decreases, while the constancy of the relative growth rates of individual bones is retained. Meanwhile, ossification decelerates less rapidly, so that the edges of adjacent bones progressively encroach upon the intervening soft tissues of the presumptive sutures until they closely approximate each other. The mode of bone growth then alters, with surface apposition by osteoblastic layers becoming predominant, producing a thicker bone. Thus, the area attained by the individual bones within the capsule depends upon the location of their ossification center and the duration and rate of peripheral osseous deposition.

The characteristic form (that is, size and shape) of the normal neural skull is the resultant of the preferential direction of the growth vectors of the expanding neural mass by these dural fiber systems.

In premature cranial synostosis, an early primary spatial malformation of the points of basal dural attachment alters the direction of neural growth vectors and results in secondary compensatory adjustments of the neural skull. Mechanical forces, such as binding of the immature head or maintenance of an habitual sleeping position, lead to primary alterations in the form of the frontal bone and other cephalic components to produce secondary basal malformations.

The common factor in each of these cases is a mechanical condition which limits the expansion of the capsule in certain directions by diverting the direction of growth vectors ultimately attributable to the neural mass. Since the magnitude of neural growth is unaffected in both cases, a change in form of the cerebral capsule results.

A suture is a remnant of the originally membranous cerebral capsule. As

a localized region within the cranial capsule, it shares with the calvarial bones a similar functional matrix. The soft tissues between two adjacent calvarial bones is a suture. A suture has several functions: It resists the separation of bones, and it allows relative motion between them.

The shape of a calvarial bone is not predetermined by the location of the sutures. It is possible to displace sutural position experimentally. The location of a suture is determined by the relative growth of adjacent bones.

The neurocranial sutures are not growth sites in any sense analogous to an epiphysis. They do not "push the bones apart." The sutural area is a site where bone may be added to compensate for the separation of bones which occurs as the cerebral capsule expands and passively carries the bones outward. As a result, extirpation of sutures in growing animals is not followed by alteration in over-all dimension of the cranium.

The intrinsic morphology of all calvarial sutural areas freed from normal functional demands is flat, butt-end articulation. Both beveling and interdigitation are responses to extrinsic forces which normally are operative when the bones are in their functional matrix.

Adjacent cranial bones cannot be made to fuse simply by pressing them against each other; there are more factors involved in synostosis than mere proximity of bone edges. Actually, sutural fusion is usually mediated by extrinsic forces. It does not occur when the bones are removed from their normal functional matrix. The external forces appear to act through the fibrous structures of the neurocranial capsule. In premature sutural fusion in man, dural changes have been postulated to arise as a result of malformations in the skull base. Evidently, cranial base alterations modify mechanical conditions within the capsule; resulting abnormal tensile forces are transmitted to the vault through the dural fiber systems and seemingly induce synostosis. Indications are that the time sequences of sutural maturation and fusion may be altered by varying the amount of intracranial contents.

A proper functional consideration of such a morphologically simple thing as a suture cannot be correct if the suture alone is studied. The calvarial sutures and bones exist in a functional matrix which includes dura, neural tissues, spaces, and muscles. Their morphology reflects the varying functional needs of this matrix.

A functional correlation between brow-ridging and jaw size is unjustified. The presence or absence of appreciable supraorbital ridges is clearly related to the spatial relationship between the orbit and the brain case alone. The form of the ectocranial surface of the neurocranium is functionally unrelated to that of the endocranial surface. Similarly independent are postnatal variations in that part of the capsule which differentiates into scalp.

The frontal bone is by no means a single functional unit. The inner table is part of the cerebral capsule, a functional component which is highly responsive to the requirements of intracranial soft tissues *at all times*. The outer table is functionally independent. Anteriorly and inferiorly, its form is associated with the support and protection of soft tissues in the orbit. Elsewhere it may be locally modified by forces due to muscle action. The middle osseous layer, the

diploë, is also functionally independent, being concerned with hematopoiesis and with pneumatization by respiratory sinuses. The frontal suture is greatly influenced by related soft tissues, dura, and cranial base and cannot be studied adequately in isolation from them.

Length and width measurements which comprise the cranial index include the functionally independent layers of bone which encase the cerebral capsule, plus any contained soft tissues. If the measurements are made over intact scalp, a further variable is added. Furthermore, the length dimension includes elements of two overlapping skull components—brain case and orbits. Nevertheless, in so far as the index gives a rough approximation of the proportions of the cerebral capsule (as it does in thin-skulled, small muscle forms such as the rat and man), its significance is not entirely obscure.

Ontogenetically, the form of the osseous skull at any moment accurately reflects the resultant of the functional demands of the protected and supported soft tissues. An identical orientation may be given to phylogenetic considerations. The obvious evolutionary changes in osseous form appear in reality to be secondary manifestations of primary changes in the related soft tissues. Evolutionary modifications in soft parts will bring about appropriate alterations in functionally related portions of the skull.

NEWS AND NOTES

American Association of Orthodontists 1962 Research Meeting

The research meeting of the American Association of Orthodontists will be a program consisting of a series of ten-minute research reports which shall be presented orally or read by title only. All persons engaged in research in orthodontics or cognate fields are invited to participate in this program, which will be held April 29 to May 3, 1962, in Los Angeles, California.

Each participant is asked to prepare a 300 word abstract of his research project for publication in the AMERICAN JOURNAL OF ORTHODONTICS and a 25 word summary of the work to be included in the program for the meeting. Abstracts for publication, summaries for the program, and the ten-minute oral presentations to be given at the meeting should be carefully prepared in order that an adequate description of the import of the work may be presented.

Forms for use in submitting the titles, 300 word abstracts, and 25 word summaries of research projects will be sent to the orthodontic department of each dental school and to any individual requesting one.

In order to be included in the program of the research meeting in Los Angeles, titles, abstracts, and summaries of research projects must be mailed not later than Jan. 1, 1962, to Dr. Richard A. Riedel, Department of Orthodontics, University of Washington, School of Dentistry, Seattle 5, Washington.

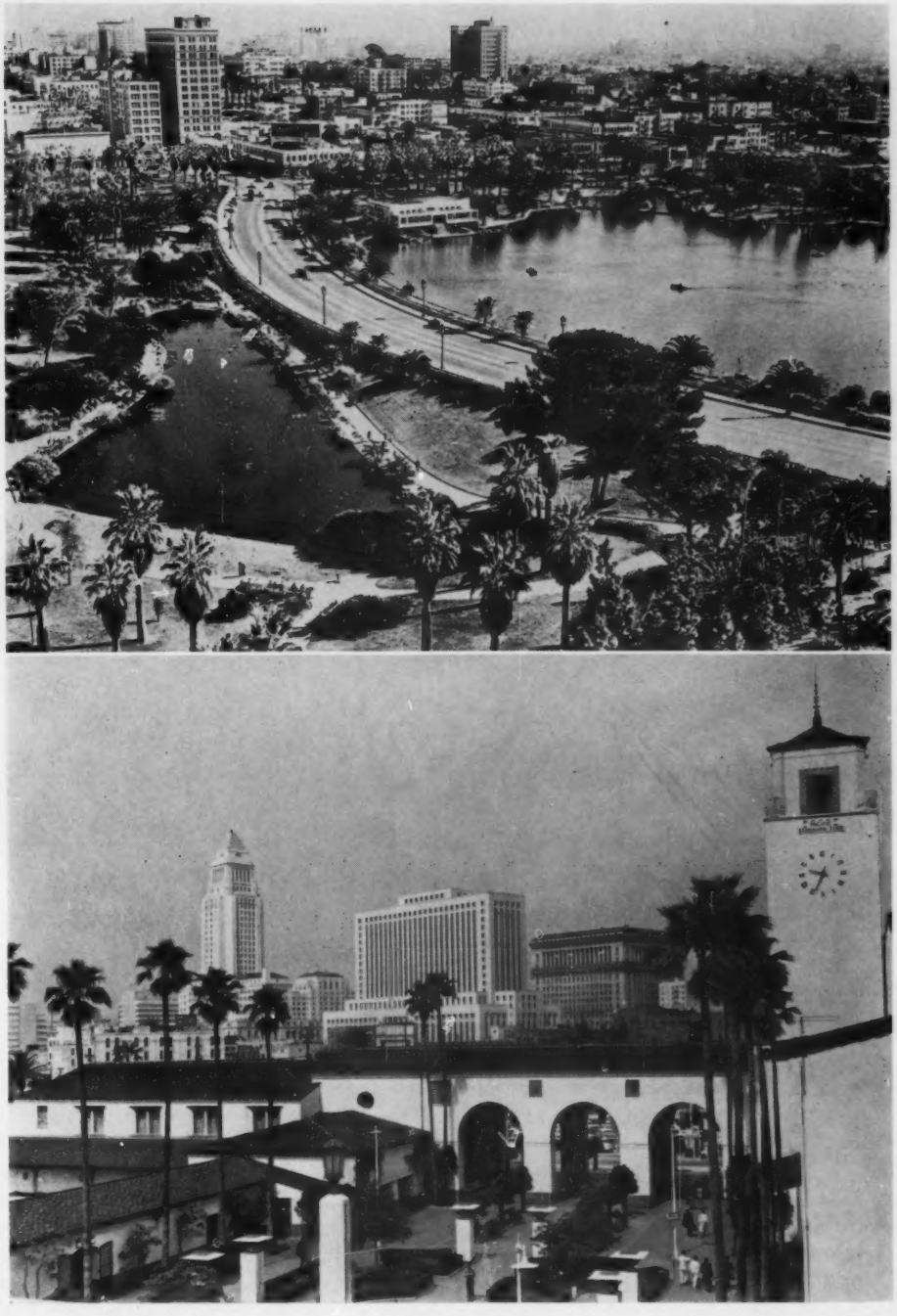
Faustin N. Weber, Chairman, Research Committee
American Association of Orthodontists
Professor and Head, Department of Orthodontics
University of Tennessee
847 Monroe Ave.
Memphis 3, Tennessee.

American Association of Orthodontists 1962 Milo Hellman Prize Essay Contest

ELIGIBILITY. Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry or associated with it as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

CHARACTER OF ESSAY. Each essay submitted must represent an original investigation and contain some new significant material of value to the art and science of orthodontics, and it must be the contestant's first research orthodontic publication.

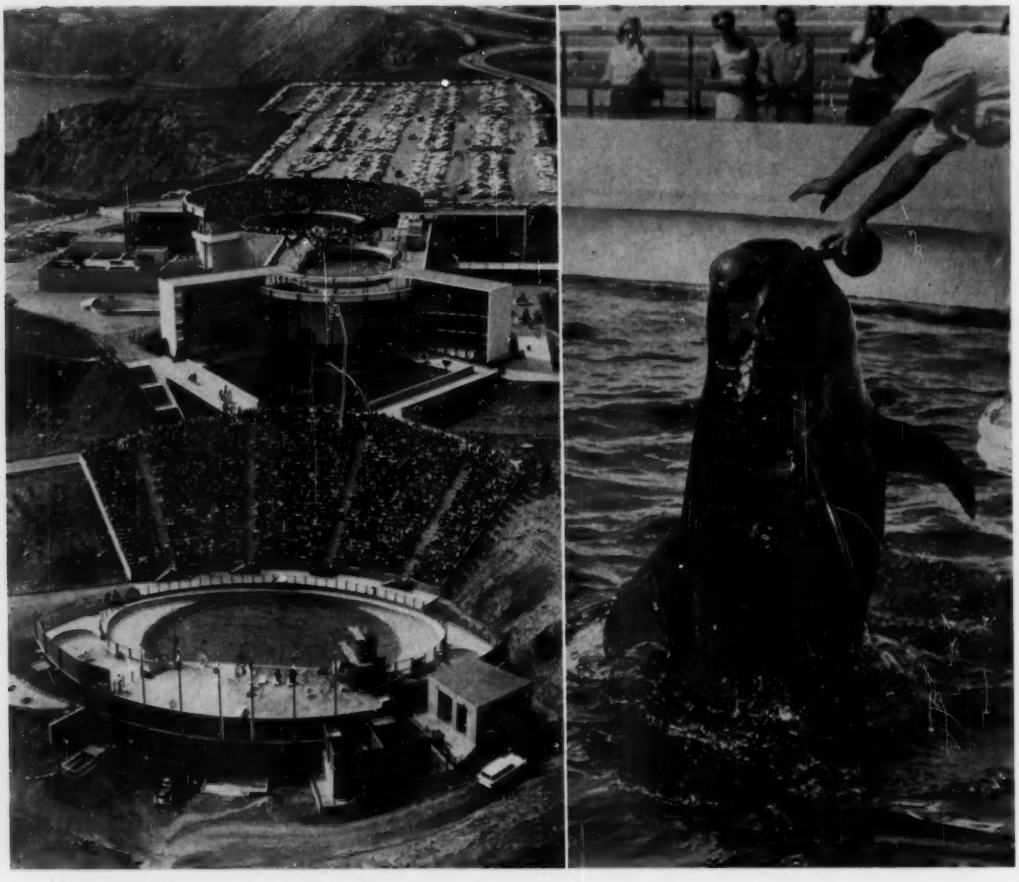
AWARDS. Two Hellman Awards are offered—one for the best work presented (the experienced as well as the new researcher is eligible for this award) and one for a researcher



Some more of the sights to be enjoyed by those who attend the annual meeting of the American Association of Orthodontists in Los Angeles, California, April 28 to May 3, 1962.

Top: Wilshire Boulevard and McArthur Park looking toward downtown Los Angeles.

Bottom: Partial view of Los Angeles Civic Center, with Union Station forecourt in foreground and City Hall in background.



Marineland of the Pacific, Los Angeles, California.

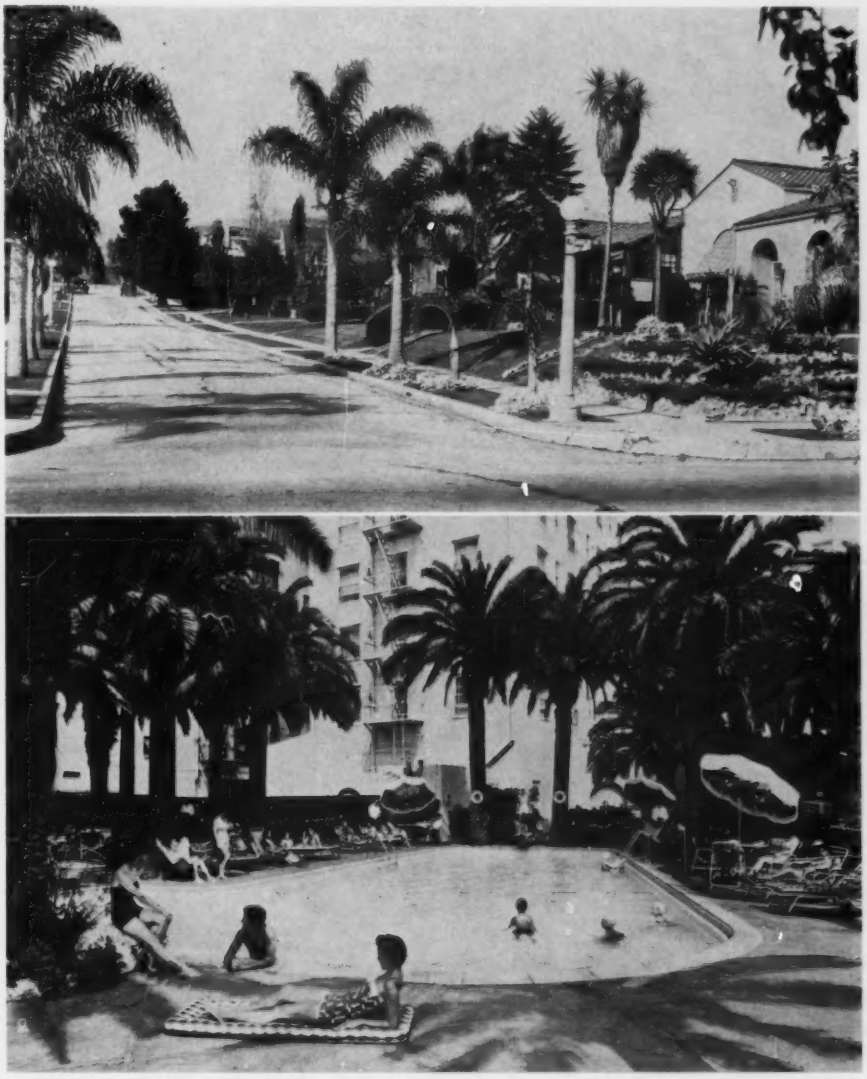
Left: Aerial view of the three-ring Sea Circus featuring, in foreground, new Seal Arena, oval Fishbowl, and circular Whale Stadium.

Right: Bubbles, star of the show in the Whale Stadium, lifts an aquaball to reduce the size of her huge tummy.

presenting his initial essay. A cash prize of $500.00 is offered for the essay judged to be the best submitted from those papers that represent the contestants' first research essay. However, the Committee reserves the right to omit either or both awards if, in its judgment, none of the essays is considered worthy of an award. Honorable mention will be awarded to the four authors whose essays are ranked immediately below the prize essay. Each of the honorable mention awards carries a $100.00 cash prize. As in the case of the prize essay, the Committee may, at its discretion, omit any or all honorable mention awards if the entries submitted are not worthy of them. The Hellman Award essays and the first two essays meriting honorable mention will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

SPECIFICATIONS. All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced, with at least 1 inch margins. Each sheet must be numbered and bound or assembled with paper fasteners in a "brief cover" for easy handling. The title of the essay should appear on the cover. Five complete copies of each essay, including all illustrations, tables, and bibliography, must be submitted. The name and address of the author must not appear in the essay. For purposes of identification, the title of the essay and the author's

name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.), should be typed on a separate sheet of paper and enclosed in a plain sealed envelope. The title of the essay should appear on the outside of this sealed envelope.



Life in Southern California. Upper photograph shows a typical Hollywood street, and lower photograph shows a swimming pool and typical poolside scene.

PRESENTATION. The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists in Los Angeles, California, April 29 to May 3, 1962.

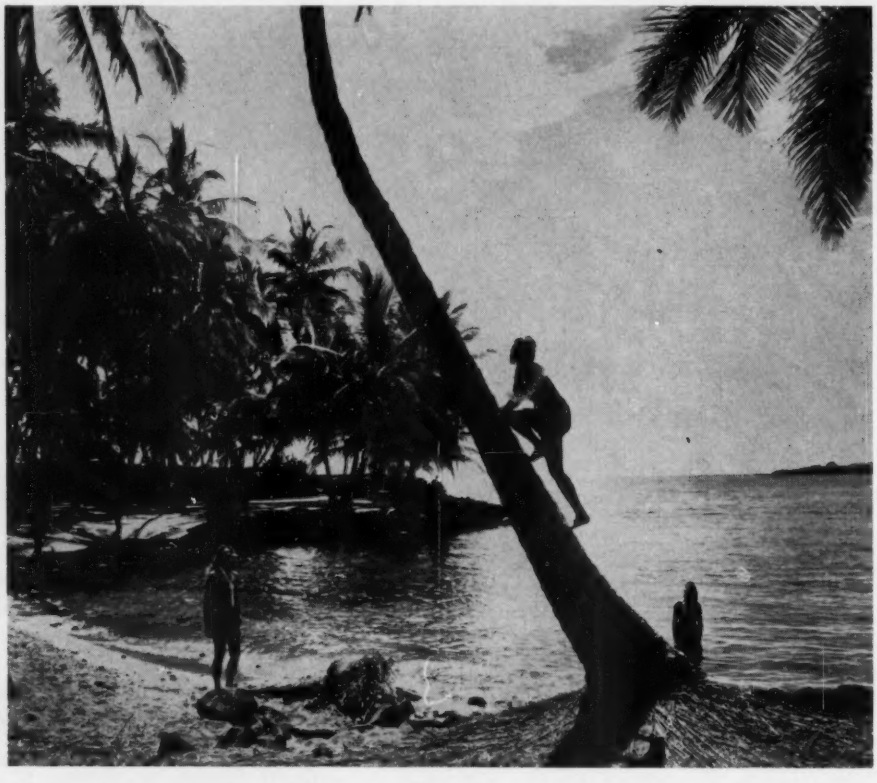
JUDGES. The entries will be judged by the Research Committee of the American Association of Orthodontists.

FINAL SUBMISSION DATE. No essay will be considered for this competition unless it is postmarked on or before Jan. 1, 1962, and five copies of the essay sent to Dr. Albert P. Westfall, University of Texas Dental Branch, Department of Orthodontics, Houston 25, Texas.

Faustin N. Weber, Chairman, Research Committee
American Association of Orthodontists
Professor and Head, Department of Orthodontics
University of Tennessee
847 Monroe Ave.
Memphis 3, Tennessee.

Hawaiian orthodontic meeting

We can think of no better way to climax the American Association of Orthodontists meeting in Los Angeles than to board a Pan-American Super Jet airliner and head for the land of palm trees and lilting music—not to mention the congenial Hawaiian people, the abundance of pineapple juice and exotic rum drinks, dancing under the stars, sunny beaches,



Honaunau Beach, Hawaii. The site of the ancient Hawaiian sanctuary, the City of Refuge, this tranquil beach on the Big Island of Hawaii is a favorite with visitors and Islanders, such as the girls shown here. You will find many such places in which to relax and just plain enjoy yourself Hawaiian style as you take part in the Hawaiian orthodontic meeting in May, 1962. (Hawaii Visitors Bureau photo.)

laughing faces swimming in crystal blue water and beach boys strumming ukeleles to all who will listen.

After two days of meetings, there will be plenty of free time to enjoy the thrills and fun of Honolulu, including Waikiki Beach and all the events that have been planned for you during your stay.

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Statler Hotel in Los Angeles, California, Monday through Saturday, April 23 to 28, 1962. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Alton W. Moore, University of Washington, School of Dentistry, Seattle 5, Washington.

Applications for acceptance at the Los Angeles meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1962. To be eligible, an applicant must have been an *active* member of the American Association of Orthodontists for at least two years.

Middle Atlantic Society of Orthodontists

The tenth anniversary meeting of the Middle Atlantic Society—the eighth and youngest of the A.A.O. sectional societies—was held on Oct. 1, 2, and 3, 1961, at Haddon Hall in Atlantic City. President Paul Reid, Program Chairman Willis McCormick, Arrangements Chairman Sol Gosman and their assistants saw to it that, from all aspects, this meeting will go down in history as one of the best.

The scientific* program featured a man considered by your editor to be one of the outstanding teachers of contemporary orthodontics, and a worthy follower of *his* famous teacher, Alan Brodie. Al Moore, of the University of Washington, had some fine new material to add to his already very respectable production. On Monday he discussed "Orthodontic Objectives," and on Tuesday he continued with illustrative case reports. Frank Bowyer, who describes himself as "unintelligent but smart," spent more time on his fluently fine introduction (which he described as "brief") than he did on a short but very informative paper entitled "The Versatility of the Labio-Lingual Appliances Utilizing Differential Light Forces." Dr. Bowyer also appeared on Tuesday's program with a paper entitled "The Occlusal Guide Plane: A Valuable Accessory in Class II Cases."

We trust the papers by Drs. Moore and Bowyer will be published in this JOURNAL in the near future. There were really some new thoughts—and, to me, that is somewhat unusual.

There was a well-attended round-table luncheon on Monday. The afternoon was devoted to the presently popular light wire techniques. Robert C. Flowers gave a case report. Howard

*With no reflection on our present essayists, the editor wonders whether the word *scientific* properly defines the professional side of our meetings. Could not someone come up with a more modest term?

S. Dimond discussed pros and cons, and Robert A. Rocke of Westville, Indiana, presented a paper entitled "Light Differential Force Treatment as advocated by Dr. P. R. Begg." (We do not know how this furor over light wires became so popular all of a sudden. Some of us have been using light wires and as light a force as we could manipulate for a few decades.) On Tuesday afternoon there were fourteen fine table clinics.

A new feature this year consisted of three limited-attendance clinics which were presented on Sunday afternoon. John A. Cooper, Ross E. Long, Robert T. Millard, S. Eugene Cohen, and Robert Berman presented these to sizeable gatherings. Another addition to the usual program was an exhibit of cases, similar to the A.B.O. reports presented at the A.A.O. meetings, selected by the Qualifying Committee, which met on Saturday and Sunday.

Entertainment functions included a Sunday afternoon "hospitality session" for the ladies. The Sunday evening cocktail hour included a very special clam and oyster bar. On Monday the ladies were well entertained at the famous Smithville Inn for luncheon and a look at the Early Americana restoration and collection. On Monday evening the President's dinner-dance was a success. Tuesday the luncheon honored Dallas A. McCauley, president of the A.A.O., and Jack Salzmann, president of the A.B.O. Both spoke, and Dr. McCauley inducted five new members and twelve new associate members into the A.A.O. and the Middle Atlantic Society.

There was a total attendance of 381. The Society now has a total membership of 152 active and 51 associate members.

The following new officers were elected:

President, William A. Giblin
President-Elect, Charles S. Jonas
Vice-President, Louis Kreshtool
Secretary-Treasurer, Paul A. Deems
Editor, Stephen C. Hopkins, Sr.
Board of Censors, Paul V. Reid (three years)
Board of Censors, B. Edwin Erikson (for unexpired term, one year)
Director to the A.A.O., Louis E. Yerkes
Alternate Director, George M. Anderson

The next meeting of this Society will be held Nov. 25 to 28, 1962, at Haddon Hall in Atlantic City.

Stephen C. Hopkins, Sr.

American Dental Association urges science fair participation

The following letter has been received from Dr. John R. Abel, president of the American Dental Association:

To: Presidents and Secretaries of Constituent and Component Societies
Dear Doctor:

One of the best means of establishing better relations between the public and the dental profession in the community is available in the science fair movement. I am sure you have become familiar with the movement through *The Journal* and the *ADA News Letter,* as well as through publicity in local and national news media.

To assist dental societies in developing programs in their communities, I am enclosing a 1962 Science Fair Kit which includes new and up-to-date information on this activity.

Local activities can be coordinated with the Association's program which culminates each year in participation in the National Science Fair. In 1962 the

national fair, at which the Association will present awards for the best exhibits related to dentistry, will be held May 2-5 in Seattle. Preliminary fairs usually are held in March and April, so it is essential that your program proceed without delay.

In addition to offering dental societies ready-made possibilities for improving public relations, science fairs provide an important medium for stimulating interest on the part of outstanding students in pursuing dental careers. The increasing numbers of dental projects at local and regional fairs indicate the effectiveness of our efforts during the past three years. But we must sustain these efforts and extend them to all communities.

Competition for scientific minds is keen. Your participation in science fairs on behalf of dentistry is important to the future of our youth, the public welfare, and our profession.

Sincerely,
John R. Abel, D.D.S.
President

*American Dental Association**

THE NEW PRESIDENT

Dr. John R. Abel of Los Angeles, who will be A.D.A. president for 1961-1962, specializes in the practice of orthodontics. He has been active in organizational affairs of the profession for many years.

Born Jan. 27, 1906, in Kenosha, Wis., he is a 1930 graduate of the University of Southern California College of Dentistry. He has served as president and treasurer as well as a member of the executive council of the Southern California State Dental Association, president of the Los Angeles Dental Society, and as a director of the American Association of Orthodontists. In addition, he has served two three-year terms on the A.D.A. Board of Trustees.

THE PRESIDENT-ELECT

Dr. Gerald D. Timmons of Philadelphia, president-elect of the A.D.A., has been dean of Temple University School of Dentistry since 1942.

He has been speaker of the House of Delegates since 1955 and is a former chairman of the A.D.A. Council on Dental Education and a past president, secretary, and treasurer of the American Association of Dental Schools.

From 1940 to 1942 he held the position of A.D.A. executive secretary and earlier served as a member of the A.D.A. Board of Trustees.

PRESIDENT PATTON RECEIVES AWARD

President Charles H. Patton received the Sigma Epsilon Delta Man of Achievement Award for 1961 at a banquet held at the Warwick Hotel in Philadelphia. The award was given in recognition of his contributions to dentistry as a teacher and community leader. Dr. I. Zucker, grandmaster of Sigma Epsilon Delta, made the presentation.

MOUTH PROTECTORS

At the 102nd annual session of the American Dental Association in Philadelphia on Oct. 14, 1961, William Heintz of Columbus, Ohio, reported on the use of mouth protectors in contact sports. He stressed the importance of all members of high school football teams wearing carefully made, properly fitting mouth protectors.

*Excerpts from the A.D.A. *Daily Bulletin.*

PANEL ON ORTHODONTIC PROBLEMS

"Early Recognition of Orthodontic Problems" was the topic of a panel discussion at the A.D.A. meeting. Michael Maxian of Manhasset, New York, served as moderator. Panel members were L. W. Robinson, Youngstown, Ohio; Max R. Kadesky, Dubuque, Iowa; and Walter H. Mosmann, Hackensack, New Jersey.

A.D.A. ACTIONS IN PHILADELPHIA

As reported in the Nov. 1, 1961, issue of the *A.D.A. News Letter,* during its 1961 meetings the House of Delegates of the American Dental Association:

—Upheld the evaluation and classification program of the Council on Dental Therapeutics.

—Adopted a resolution stating that after Jan. 1, 1965, all A.D.A. members who have not previously announced limitation of practice and who desire to announce themselves as limiting their practice exclusively to one of the approved areas will be required to complete two or more academic years of advanced education as specified by the certifying boards, essentially all of which must be in or directly related to the selected area, or possess a state license permitting announcement in an A.D.A.-approved area.

—Referred for study and preparation of a report to the 1962 House a resolution that would rescind the amendment dealing with announcement of specialty practice, made to section 18 of *Principles of Ethics* by the 1960 House.

—Rejected a resolution calling for appointment of a special committee to study problems of specialties.

—Approved, in amended form, the statement of policy regarding experimentation in training and utilization of dental hygienists and dental assistants which had been developed at a conference in June, 1961. The House urged caution in the interpretation and implementation of the results of research programs on the extension of duties of auxiliary personnel so that unsupervised and unlicensed persons will not be encouraged to engage in the actual practice of dentistry.

B. F. Dewel gives course in Madrid

At the invitation of the Spanish Society of Orthodontists, B. F. Dewel, vice-president of the American Board of Orthodontics, presented a two-day postgraduate course in Madrid last September.

The course covered several aspects of mixed-dentition treatment, such as diagnostic analysis during the mixed dentition, serial extraction in orthodontic treatment procedures with the edgewise appliance, etc.

The course was organized by Dr. Juan Canut, who translated the lectures and the many questions and answers which followed each presentation. Both have been translated into Spanish, published in an 88 page booklet, and distributed to all the orthodontists who attended this course. A copy has been sent to the library of the American Dental Association.

At the final banquet, Dr. Costa del Rio, president of the Society, speaking for his colleagues, gave Dr. Dewel a sincere word of appreciation for those two unforgettable days in which the Spanish orthodontists were able to share Dr. Dewel's clinical experience with the problems involved in the treatment of mixed-dentition malocclusions.

Spanish Society of Orthodontists

The Spanish Society of Orthodontists will meet in Sevilla, Spain, March 14 to 18, 1962, under the presidency of Dr. Ernesto Vilches, Avda. Republico Argentina 3, Sevilla, Spain.

Major General Joseph L. Bernier to give Herman L. Reiss Memorial Lecture

Major General Joseph L. Bernier, Chief of the Army Dental Corps, delivered the tenth annual Herman L. Reiss Memorial Lecture at the New York Academy of Medicine on Monday, Oct. 30, 1961.

The lecture memorializes Dr. Herman L. Reiss, a native New Yorker, whose greatest pleasure was in teaching and developing young dentists aspiring to become expert oral surgeons. He was deeply interested in pathology and insisted on its thorough understanding as a basis for surgical training. Dr. Reiss was president of the New York Institute of Clinical Oral Pathology when he died in October, 1951.

General Bernier chose "Correlation of the Roentgenologic and Histologic Features of Certain Tumors of the Jaws" as the title of his presentation.

During the early years of his military service, General Bernier was assigned as an oral pathologist at the Army Medical Museum (now the Armed Forces Institute of Pathology), where he completed the revision of the *Atlas of Dental and Oral Pathology*, a standard reference in that field. In fact, most of his twenty-seven years of military service were at the Institute, prior to his becoming Chief of the Army Dental Corps on Aug. 1, 1960. In addition to his military duties, General Bernier is a professor of oral pathology at Georgetown University, a visiting professor to the Jefferson Medical College at Philadelphia, and a special lecturer at Fairleigh-Dickinson Dental School at Teaneck, New Jersey.

Announcement of Regular Corps examination for dental officers, United States Public Health Service Commissioned Corps

Competitive Examinations for appointment of dentists as officers in the Regular Corps of the United States Public Health Service Commissioned Corps will be held throughout the United States on Feb. 13, 14, and 15, 1962.

Appointments provide opportunities for career service in clinical dentistry, research, and public health. They will be made in the PHS officer grades of Assistant Dental Surgeon and Senior Assistant Dental Surgeon, equivalent to Navy ranks of Lieutenant (j.g.), and Lieutenant, respectively.

Entrance pay is $7,345.00 per year for Assistant Dental Surgeon with dependents and $7,986.00 for Senior Assistant with dependents. *Promotions* are made at rapid intervals.

Benefits include periodic in-grade pay increases, thirty days' annual leave with pay, sick leave with pay, full medical care, disability retirement pay, retirement pay (three-fourths of annual basic pay at time of retirement), and many other privileges.

Active duty as a Public Health Service officer fulfills the Selective Service obligation for military duty.

Requirements are United States citizenship and graduation from a recognized school of dentistry. For the rank of Assistant Dental Surgeon, at least seven years of collegiate and professional training and appropriate experience are needed. For Senior Assistant Dental Surgeon, an additional three years, for a total of at least ten years of collegiate and professional training and appropriate experience, are needed. For appointment to the Assistant grade, candidates must be under 34 years of age; candidates for the Senior Assistant grade must be under 37.

Entrance examinations will include an interview, physical examination, practical examination, and comprehensive objective examinations in the appropriate professional fields.

Application forms may be obtained by writing to the Surgeon General, United States Public Health Service (P), Washington 25, D. C. Completed application forms must be received no later than Jan. 5, 1962.

Courses in orthodontics sponsored by universities

NORTHWESTERN UNIVERSITY

The Department of Orthodontics of the Northwestern University Dental School announces the following postgraduate courses:

Functional Analysis and Treatment of the Masticatory System for the Orthodontist. Dec. 4 to 6, 1961.

Functional Analysis and Treatment of the Masticatory System for the General Practitioner. Jan. 22 to 24, 1962.

Basic Cephalometric Radiography. Feb. 12 to 14, 1962.

Advanced Cephalometric Radiography. June 24 to 26, 1962.

TUFTS UNIVERSITY

Tufts University School of Dental Medicine announces the following courses:

The Application of Scientific Light Continuous Forces to the Edgewise Mechanism. Jan. 25 to 27, 1962. Morris M. Stoner.

Analysis and Treatment Employing a Light Edgewise Technic. March 15 to 17, 1962. John T. Lindquist.

UNIVERSITY OF PENNSYLVANIA

Dr. Viken Sassouni will give a postgraduate course in cephalometry Jan. 22 to 25, 1962, at the University of Pennsylvania.

UNIVERSITY OF ALABAMA

The School of Dentistry announces that a course in "Removable Orthodontic Appliance Construction" will be given Feb. 24 to 26, 1962, by Samuel D. Gore.

UNIVERSITY OF OREGON

Applications are being accepted for the newly formed graduate program in orthodontics, the first class beginning on March 26, 1962. Requests for application materials should be directed to the Office of the Registrar, and inquiries will be received as late as Feb. 10, 1962. The results of the aptitude section of the Graduate Record Examination are required of all applicants. For those who have not taken this examination, the application form will be included in the application packet and arrangements should be made to take the examination as soon as possible. All applicants will be notified of the action of the Graduate Admissions Committee concerning their applications as soon as the required documents are received and evaluated.

Fees are as follows:

Tuition	$ 75.00
Laboratory and course fee	90.00
Incidental fee	24.00
Building fee	8.00
Total resident charge	$197.00

Nonresident fee (in addition to fees for resident students)	116.00
Total nonresident charge	$313.00
Books and supplies (approximate)	$300.00

Notes of interest

Eldon D. Bills, D.D.S., M.S., announces the opening of his office for the practice of orthodontics in the North Beaver Street Medical-Dental Building, 715 North Beaver St., Flagstaff, Arizona.

James G. Rayes, D.D.S., M.S., announces the opening of his office at 401 South Pineapple Ave., Sarasota, Florida, practice limited to orthodontics.

Forthcoming meetings of the American Association of Orthodontists:

1962—Statler Hotel, Los Angeles, California, April 28 to May 3.
1963—Hotel Fontainebleau, Miami Beach, Florida, May 5 to 9.
1964—Palmer House, Chicago, Illinois, May 10 to 14.
1965—Dallas Statler-Hilton, Dallas, Texas, April 25 to 30.

*Officers of Orthodontic Societies**

The *American Journal of* ORTHODONTICS is the official publication of the American Association of Orthodontists and its sectional societies. The Editorial Board of the JOURNAL is composed of a representative of each of the sectional societies.

American Association of Orthodontists *Next meeting April 28–May 3, 1962, Los Angeles*

President, Dallas R. McCauley, 410 South Beverly Dr., Beverly Hills, Calif.
President-Elect, J. A. Salzmann, 654 Madison Ave., New York, N. Y.
Vice-President, J. Lyndon Carman, 501 Republic Bldg., Denver, Colo.
Secretary-Treasurer, Earl E. Shepard, 225 South Meramec, Clayton, Mo.

Great Lakes Society of Orthodontists

President, Paul V. Ponitz, 914 Security Bank Bldg., Battle Creek, Mich.
Secretary, Edward A. Cheney, 2900 Grand River, Lansing, Mich.
Director, Harlow L. Shehan, 601 Jackson City Bank Bldg., Jackson, Mich.

Middle Atlantic Society of Orthodontists *Next meeting Nov. 26-29, 1962, Atlantic City*

President, William A. Giblin, 85 Park St., Montclair, N. J.
Secretary-Treasurer, Paul A. Deems, 835 Park Ave., Baltimore, Md.
Director, Louis E. Yerkes, 825 Linden Ave., Allentown, Pa.

Midwestern Society of Orthodontists *Next meeting Sept. 16-18, 1962, Omaha*

President, Elmer S. Bay, 216 Medical Arts Bldg., Omaha, Neb.
Secretary-Treasurer, Kenneth E. Holland, 1016 Sharp Bldg., Lincoln, Neb.
Director, G. Hewett Williams, 811 Elm St., Winnetka, Ill.

Northeastern Society of Orthodontists *Next meeting March 11-13, 1962, New York*

President, Irving Grenadier, 888 Grand Concourse, New York, N. Y.
Secretary-Treasurer, David Mossberg, 36 Central Park S., New York, N. Y.
Director, Norman J. Hillyer, 230 Hilton Ave., Hempstead, L. I., N. Y.

Pacific Coast Society of Orthodontists *Next meeting February, 1964, Las Vegas*

President, Herbert V. Muchnic, 435 N. Roxbury Dr., Beverly Hills, Calif.
Secretary-Treasurer, Warren A. Kitchen, 2037 Irving St., San Francisco, Calif.
Director, William S. Smith, 2530 Bissell Ave., Richmond, Calif.

Rocky Mountain Society of Orthodontists

President, Louis J. Williams, 9th & Center Sts., Casper, Wyo.
Secretary-Treasurer, Hubert J. Bell, Jr., 230 Mercantile Bank Bldg., Boulder, Colo.
Director, Louis J. Williams, 9th & Center Sts., Casper, Wyo.

Southern Society of Orthodontists

President, Charles E. Harrison, 362 Sixth St., S., St. Petersburg, Fla.
Secretary-Treasurer, William H. Oliver, 1915 Broadway, Nashville, Tenn.
Director, Boyd W. Tarpley, 2118 Fourteenth Ave., S., Birmingham, Ala.

Southwestern Society of Orthodontists

President, Harold S. Born, 908 S. Johnstone Ave., Bartlesville, Okla.
Secretary-Treasurer, Tom M. Matthews, 8215 Westchester Dr., Dallas, Texas
Director, Nathan Gaston, 701 Walnut St., Monroe, La.

American Board of Orthodontics *Next meeting April 23-28, 1962, Los Angeles*

President, J. A. Salzmann, 654 Madison Ave., New York, N. Y.
Vice-President, B. F. Dewel, 708 Church St., Evanston, Ill.
Secretary, Alton W. Moore, University of Washington School of Dentistry, Seattle, Wash.
Treasurer, Paul V. Reid, 1501 Medical Arts Bldg., Philadelphia, Pa.
Director, Frank P. Bowyer, 608 Medical Arts Bldg., Knoxville, Tenn.
Director, Nathan G. Gaston, 701 Walnut St., Monroe, La.
Director, Richard M. Railsback, 1333 Grand Ave., Piedmont, Calif.

*In order to keep this list up to date, the editor depends on the various sectional editors to notify him immediately of changes in officer personnel.

American Journal of ORTHODONTICS

Official publication of The American Association of Orthodontists, its sectional societies, and The American Board of Orthodontics

Editors

Sectional editors

VOLUME 47
JANUARY–DECEMBER, 1961

VOLUME 47

946

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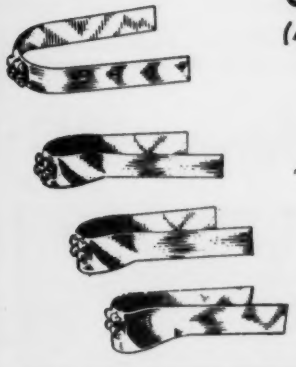

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rimmed individual tooth dies, ready to and.	Dies and bands complete with all at- tachments . . . ready to cement into place.
ubber base or silicone impression and our detailed instructions on prescrip- on form.	Trimmed individual tooth dies set in keyway model . . . ready for you to band.
omplete arch poured in suitable die naterial.	Trimmed individual dies . . . ready for you to band.
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FLORIDA licensed orthodontist wanted for association in Greater Miami area. Formal edgewise training necessary. Reply to Box CD, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

ORTHODONTIST, University trained desires association, partnership or purchase of practice. Preferably in the Philadelphia area. Reply to Box KI, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

Orthodontist desires associate for suburban Chicago practice. Formal education in Edgewise Technique is essential. Reply to Box MG, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

California licensed Orthodontist, University trained in the Edgewise appliance, desires association. Receiving Master's degree in May 1962. Military obligations completed. Reply to Box VE, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

MASSACHUSETTS—Wanted a university trained orthodontist to associate with an established busy orthodontic practice. Please send full details to Box HI, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

Connecticut, New York, New Jersey, Pennsylvania licensed Orthodontist, age 30, desires association, partnership, location or purchase of practice. Two years university training, edgewise and twin wire. Military obligation complete. Please reply to Box LH, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

A real opportunity exists in central Colorado for an orthodontist trained and using the Labio-Lingual and Johnson Twin Wire Technics. Reply to Box DI, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

CALIFORNIA licensed Orthodontist—University trained—desires Association in Los Angeles Area. Reply to Box DS, American Journal of Orthodontics, 3207 Washington Blvd., St. Louis 3, Missouri.

American Journal of Orthodontics

INDEX TO ADVERTISERS

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

NO. 6 OF A SERIES: USING RM ADAPTING CABLES

STRESS-RELIEVING PREFAB RM LINGUAL ARCHES

While many new users of RM Multi-Purpose Equipment seem to think of the cables only as attachments for electric soldering, they are also helpful for stress relieving and have been so used for nearly 30 years. Those who employ RM Prefab Lingual Arches are among the most enthusiastic users today. The technique is simple: Preformed Molar Bands are fitted direct; Buccal Tubes and Prefab Lingual Tubes are welded; impression is taken; stone model is made with bands in position; model is measured with soft wire and compared with RM Lingual Arch Rule to select correct size; Prefab Lingual Arch is bent into position; cables are used on low heat to bring wire to dull metallic color (If Prefab Chrome Steel Arch is used, heat relieves stresses and sets wire passively into position. If Soft Blue Elgiloy is used, heat will temper it as it is set in place.) If indicated, springs are welded or soldered, and arch is finished by electrolytic polishing. Like other electro-mechanical auxiliaries, the Adapting Cables are important elements of Rocky Mountain's integrated system of appliance fabrication for all techniques. For more information on the mechanics of this and other time-saving procedures, visit the RM exhibit at your next orthodontic meeting or arrange to attend one of the special mechanical demonstrations and workshop sessions held periodically in our New York, Denver and San Francisco offices.

ROCKY MOUNTAIN® New York DENVER San Francisco

The delicacy and strength of RM GREEN (Temper) Elgiloy can help you speed treatment of many cases by reducing chair time and by making it possible to lengthen periods between appointments. ■ Having superior qualities of spring performance and resistance to set, small Elgiloy Wires will deliver continuous light forces over longer periods of time without need for adjustments and changes. ■ GREEN Tempered Elgiloy is excellent for twin arches, Edgewise starting arches, and light wire arches. The temper is slightly below the temper of highly resilient stainless steel. This unique working temper enables you to bend and loop it easily without danger of breakage. The special spring temper is added by heat-treating, and the arch is then finished by electrolytic passivation and polishing. ■ When tied in place, the finished GREEN Elgiloy arch will not distort or take a set. It will retain the shape you have given it and work for you continuously. ■ Also important: You can rely on the consistency of each piece of each different package, because RM Elgiloy is controlled and guaranteed. ■ Predictable mechanical performance, the saving of operating time, and the improvement and extension of orthodontic services are important areas of research and development today. While not the answer by itself, RM Elgiloy is a significant advancement, which is contributing to the realization of these ever-present objectives. *(Note: Green color identification is on tip of each piece.)*

THE AMERICAN CANCER SOCIETY

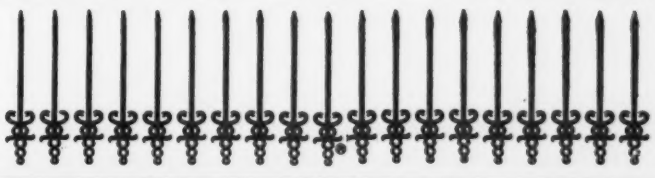
is dedicated to saving lives from cancer and spearheads the fight against cancer quackery. Its Committee on New or Unproved Methods of Treatment of Cancer has a membership of physicians, lawyers, educators, and public relations specialists. This committee has been a prime mover in developing constructive action

against cancer quackery

Inspired by model legislation formulated by this committee with the active cooperation of the California Medical Association, California, Kentucky and Nevada recently passed bills providing the first effective means of fighting cancer quackery at its base of operations—in the local community.

To keep both the public and the medical profession informed, the Society has established, in its national office, a central repository of material on new or unproved methods of cancer diagnosis, treatment and cure—a principal source of such information in this country.

The American Cancer Society, in this as in all its efforts, serves both the private citizen and the practicing physician—and is, in turn, served by both.



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- Conform equally well to upper and lower molar bends and contours.
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½ lb. bottle powder
20 cc. dispensing bottle of liquid
2 oz. reserve bottle of liquid
$35.00

New Germicidal Kryptex is also available in—
½ oz. full portion powder . $ 3.00
½ lb. bottle powder . . . 25.00
2 bottle liquid unit . . . 12.50

NEW GERMICIDAL KRYPTEX®

Helps prevent decay under bands

New Germicidal Kryptex contains 0.2% mercurammonium chloride—now combines potent germicidal action with great strength and holding power . . . helps prevent decay under orthodontic bands.

The color, deep yellow, is easily distinguishable from enamel upon removal of bands . . . speeds the "clean-up" procedure. New Germicidal Kryptex may also be used for filling deciduous teeth, as well as pits and fissures in 6-year molars.

Note: Success in cementing orthodontic bands with New Germicidal Kryptex depends upon a tacky mix that resembles soft putty.

S.S.WHITE

THE S. S. WHITE DENTAL MFG. CO. 211 S. 12th St., Phila. 5, Pa.